1-1-1980

Perkinsus marinus = Dermocystidium marinum ("Dermo") in Virginia, 1950-1980 : a record of fluid thioglycollate tests for Dermo in oysters from public and private oyster beds, and from trays of disease-free oysters transplanted to areas where MSX and Dermo are endemic

Jay D. Andrews
Virginia Institute of Marine Science

Perkinsus marinus = *Dermocystidium marinum* ("Dermo") in Virginia, 1950-1980[1]

by

Jay D. Andrews

Virginia Institute of Marine Science

School of Marine Science

College of William and Mary

Gloucester Point, Virginia 23062

Data Report No. 16

A Record of Fluid Thioglycollate Tests for Dermo in Oysters from Public and Private Oyster Beds, and from Trays of Disease-Free Oysters Transplanted to Areas Where MSX and Dermo are Endemic

[1] Available on microfiche at MERRMS, Virginia Institute of Marine Science, Gloucester Point, Virginia 23062.

Acknowledgements

I wish to pay tribute to Dr. Willis G. Hewatt who stimulated oyster mortality studies in Virginia. He returned every summer through the 1950's and early 1960's to teach invertebrate zoology and conduct research on oysters with me. Dexter Haven worked full-time in oyster research with me during this period. He helped monitor trays of oysters and read thioglycollate tests occasionally.

In 1955, Curtis Leigh became the first full-time technician at VIMS and continued to serve me for 25 years until 1 January 1980. He contributed greatly to the efficiency of tray-monitoring of oysters. During the 1950's two families of high school girls worked evenings and Saturdays to conduct fluid thioglycollate tests for Dermo. The Burke girls, Pat and Nancy, and the Gantt girls, Sally, Jean, Lynn, and Ann were faithful workers when help was scarce. Dr. Hewatt and I did the reading and ratings of thioglycollate tests during this period. In the early 1960's Nancy Burke read slides until Mrs. Nita Walker began reading for an extended period of 17 to 18 years. Mrs. Walker has kept all Dermo records for this long period and prepared media and antibiotics. Only penicillin and streptomycin were used during the 29 years of thioglycollate tests.

Two field technicians, James Brown and James Harris, worked 15 years tending trays and collecting gapers for tests. They became extraordinarily efficient in detecting boxes and gapers and also in achieving accurate counts.

Perkinsus marinus: *Dermocystidium marinum* ("Dermo") in Virginia, 1950-1980

List of Contents

(mostly unpublished data)

Page

Part I. Geographic Distribution and Intensities of *Dermocystidium marinum*, Descriptions of Monitoring Station, Lists of Trays, Summaries of Prevalences and Intensities in Live Oysters and Gapers, Overwintering of the Pathogen, and Notes on Mortalities and Seasonality of Dermo.

1. Fig. 1. Map of locations of stations and a list of stations by rivers 1

2. Fig. 2. Map of Virginia sector of Chesapeake Bay showing distribution and intensity of *P. marinus* infections. 2

3. Introduction and explanation of Dermo studies at VIMS, 1950 to 1980 4

4. Description of location and characteristics of tray-monitoring stations in Virginia waters 17

5. List of legged trays used to monitor diseases in Virginia on natural oyster beds 1959 to 1980. Tray lots are numbered in chronological order by rivers and by years. Sources of oysters and sites of monitoring are given along with dates

of initiation (transplanting or gathering into trays) and cessation of monitoring 23

6. List of oyster trays monitored on Seaside and Bayside of Eastern Shore, Virginia, 1959-1980 29

7. History of lab-bred progeny groups of selected oysters monitored off VIMS or at Tillages Ground, York River, 1964 to 1980 35

8. Table 1. Peak seasonal prevalences of P. marinus ("Dermo") in native acclimated oysters at key stations in Virginia rivers, from public oyster beds (mostly Sept. and Oct. samples), 1953 to 1980 42

9. Table 2. Incidence of Dermocystidium in James River (25 oysters per sample). 1959 compilation 46

10. Table 3. Recovery of gapers from trays, 1952 to 1955. 47

11. Table 4. Comparison of D. marinum infections in yearling oysters held in trays at Gloucester Point, 1954. (VIMS Pier) 50

12. Table 5. Occurrence of D. marinum in live oysters of the Chesapeake Bay area. (Prepared for 1957 paper.) 55

13. Table 6. Summary of Dermocystidium marinum infections in oysters from the hurricane-mortality areas. (Rappahannock and York rivers), 1955 56

14. Table 7. Thioglycollate culture tests of live oysters for Dermocystidium marinum, August and September 1955. (Rappahannock and York rivers following hurricanes Connie and Dianne in mid-August that caused oyster mortalities.). . . 57

15. Table 8. Thioglycollate culture tests of gapers for Dermocystidium marinum, August and September 1955 hurricane mortalities. 58

16. Table 9. History of five series of live-oyster samples tested for D. marinum. (To determine seasonality of pathogen.) 59

17. Table 10. Monthly tests for Dermocystidium marinum in live oysters, Hoghouse Bar (Rappahannock River), native oysters dredged from an endemic area 60

18. Table 11. Annual mortalities from D. marinum and prevalences of the pathogen in gapers from trays at VIMS Pier 63

19. Table 12. Mortalities of tray oysters and prevalences of Dermocystidium marinum in gapers at VIMS Pier, 1952 to 1959. . 64

20. Table 13. Effects of density and proximity of infected oysters on incidence and intensity of Dermocystidium marinum in disease-free imported oysters 67

21. Table 14. Causes of deaths of gapers from susceptible James River oysters in York River, 1979 68

22. Table 15. Incidence of D. marinum in gapers at VIMS Pier by months, 1952-1954 69

23. Method of overwintering of Dermo (P. marinus) in oysters by J. D. Andrews, 9 January 1981 73

24. Summary of overwintering of D. marinum in Hoghouse Bar (Rappahannock River) oysters dredged 1 June 1955 and held at VIMS Pier for two years, 22 December 1980 80

25. Notes on problems with Dermo for Dr. Hewatt by J. D. Andrews, 25 June 1962. 84

26. Why did prediction of Dermo-caused oyster deaths fail in 1957? 87

27. A summary of tray mortalities and Dermocystidium marinum studies of oysters in Virginia in 1959 89

28. List of trays of oysters monitored at VIMS Pier, 1950 to 1967 98

29. Notes on Dermo activity in 1959, a pre-MSX year 101

30. The early deaths of oysters in trays at VIMS Pier from Dermocystidium in 1957. (Written in 1957) 107

Dermo in post-MSX years 109a&b

31. Table 16. Prevalences and intensities of P. marinus (Dermo) in gapers from Virginia Waters, 1966 110

Table 16 Dermo in gapers, 1967 111a

32. Table 17. Prevalences and intensities of P. marinus (Dermo) in gapers from Virginian waters, 1968 112

33. Summary of information about Dermocystidium that relates to claims of new epizootic pathogen in Maryland. 115

Part II. Occurrence of D. marinum (Dermo) in Live Oysters in Virginia, 1952 to 1980. Presented as Annual Lists of Fluid Thioglycollate Tests in Chronological Order by River Areas

PART I

Figure 1. List of Stations for Tray Monitoring of Oysters.

James River

1. Darlings Watchhouse
2. Nansemond Ridge
3. Brown Shoal
4. Darlings Corner Stake
5. Wreck Shoal
6. Rainbow Rock
7. Horsehead Rock
8. Deep Water Shoal

York River

1. Mobjack Bay
2. Ellen Island
3. VIMS Pier
4. Ferry Pier
5. Tillage Area
6. Mt. Folly Point
7. Roane Point
8. Bell Rock

Piankatank River

1. Cherry Point
2. Cape Toon
3. Island Bar, Fishing Bay
4. Palace Bar
5. Hole-in-the-Wall

Rappahannock River

1. Broad Creek
2. Windmill Point
3. Parrotts Rock
4. Hoghouse Bar
5. Balls Point
6. Bowlers Rock

Seaside - Eastern Shore

1. Outlet Bay
2. Hog Island Bay
3. Swash Bay
4. Bradford Bay
5. Chincoteague Bay

Bayside - Eastern Shore

1. Cherrystone Inlet
2. The Gulf
3. Hungars Creek
4. Occohannock Creek
5. Nandua Creek
6. Chesconessex Creek
7. Messongo Creek

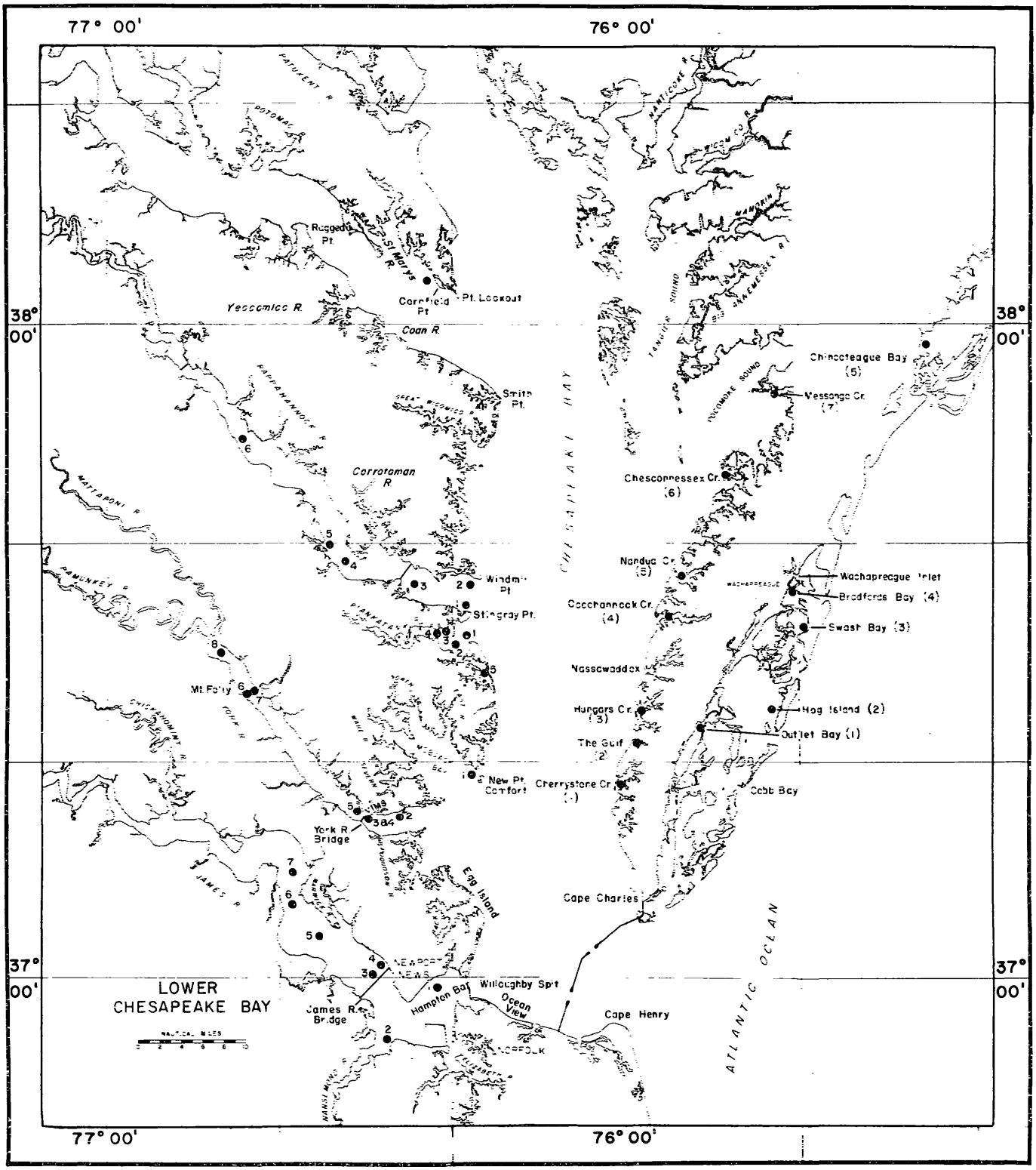

Figure 1. Map of stations monitored for D. marinum and MSX. Sampling stations for oysters taken from public and private beds, and trays of oysters to determine prevalences and mortalities of diseases in Lower Chesapeake Bay.

Fig. 2. Distribution and Intensity of Activity of Dermo.

It is fairly easy to describe the maximum range or distribution of Dermo in favorable years when plenty of oysters are available for it to parasitize. These conditions prevailed in the 1950's with peak levels of infection and greatest mortalities in the years 1954 and 1959 in Virginia. Perhaps most useful is to describe levels of activity that would occur in average years, if an abundance of oysters were available as hosts. Many large areas planted with James River seed oysters in pre-MSX days are now essentially barren of live oysters and even shell for cultch. Dermo lingers in low status on public grounds and around man's piers, bridges and other in-water structures. If grounds in the open waters of Mobjack Bay were to be planted again with lots of oysters, it would take several years for Dermo to reach the 1950's level of activity. We experienced this recently on a small bed of shells planted at the mouth of Sarahs Creek near Gloucester Point, Va. The oysters set in 1975 and were tonged for market in 1978 with almost no losses to Dermo, despite proximity of piers within two- or three-hundred yards (see Y102, 14 September 1978, oysters placed in a tray at time of public harvesting).

Figure 2 represents an attempt to depict areas of high and low mortality in average years, once planting has resumed and Dermo given a few years to become established in the area. For this purpose, rough boundaries have been drawn over a map of the distribution of MSX depicting expected weighted incidences and mortalities for average

years. No exact weighted incidence can be given for all areas in all years, but the value of 0.5 W.I. seems to represent the level at which mortalities begin and 1.00 is fairly typical of moderate kills in the 1950's. In some long, warm summers the weighted incidence may rise to 2.00 which is usually accompanied by very serious mortalities. An early warm period in June and a late warm period in September and October may combine to prolong the Dermo season and permit 2nd and 3rd generation infections to cause heavy mortalities. A rough equivalence of 1.0 W.I. with 20 to 30% mortality and 2.0 W.I. with 50% or more deaths seemed to occur in the 1950's. If these levels of weighted incidence occur early (August) before the usual peak prevalences for the year about 1 October, there may be greater deaths.

The maximum distribution of Dermo approximates the boundaries shown for MSX. Dermo does not fluctuate in distribution as much or as rapidly as MSX by years, but neither does it disappear as rapidly as MSX does, once established. To obtain peak levels of Dermo prevalences and intensities, sampling should be done in September and October.

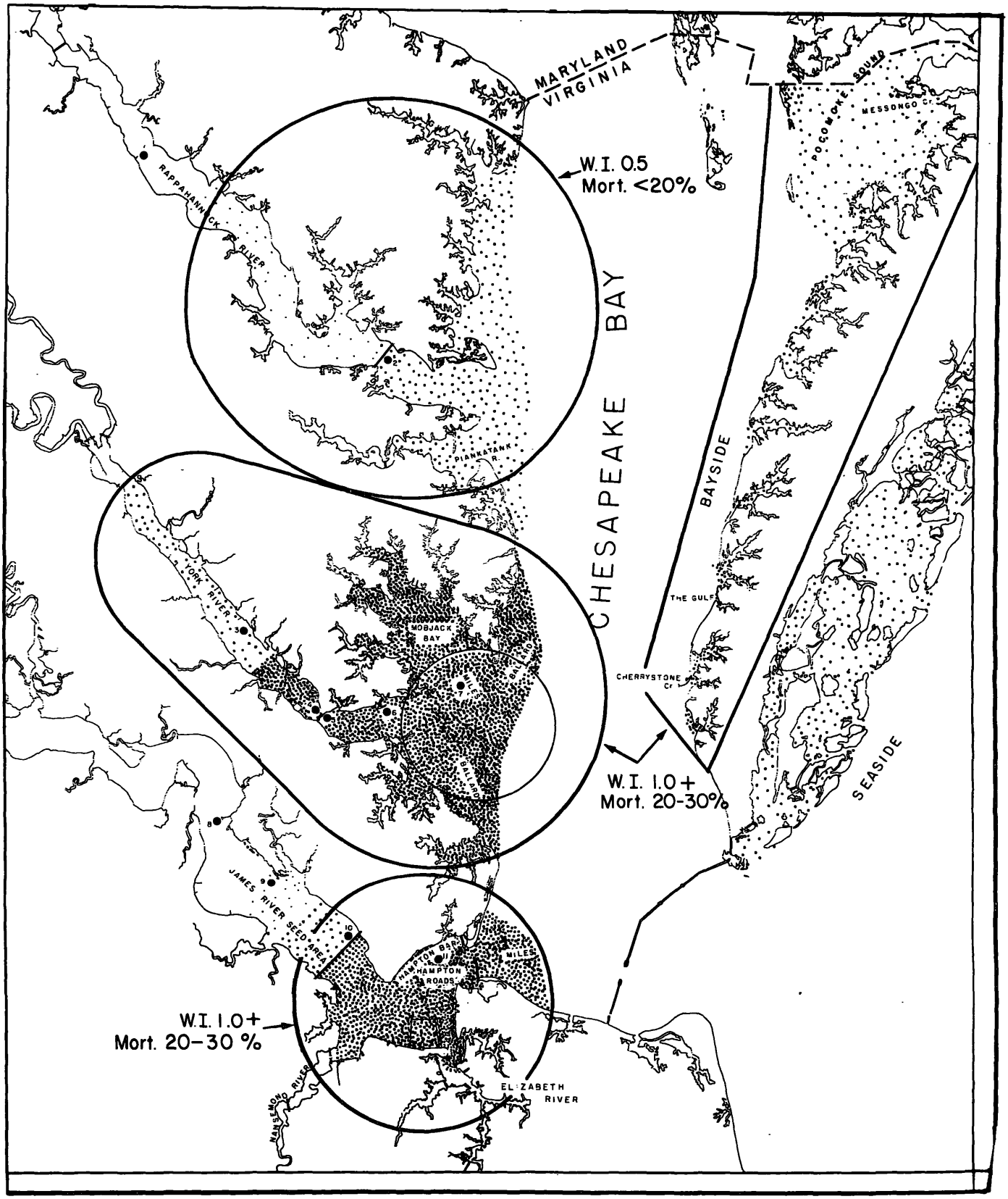

Figure 2. Weighted incidences of D. marinum and resulting mortalities in average years when normal populations of oysters are present--e.g. pre-MSX years. Dermo activity defined inside the heavy lines superimposed on MSX distribution and intensity, see Andrews and Wood, 1967, for stations.

Introduction to Tables of Dermo Testing, 1952 to 1980

I. History of *P. marinus* in Virginia

J. D. Andrews

Virginia Institute of Marine Science

15 January 1980

Studies of oyster mortalities by the tray method were begun in 1950 by Dr. Willis G. Hewatt of Texas Christian University, Fort Worth Texas. Three Sea-Rac® trays obtained from the Chesapeake Corporation's extensive tray grow-out operation of 1931 to 1941 in Queens Creek, York River, were filled with market-sized oysters for monitoring deaths. Several gapers from this collection were sent to Dr. J. G. Mackin at Texas A&M University at College Station, Texas. He reported that *Dermocystidium marinum*, as the new pathogen was then called (Mackin, Owen and Collier, 1950), was present in Virginia.

Monitoring of "Dermo" has continued in Virginia throughout the 31 years since that first summer exploration. Dr. Hewatt participated in the huge study of the Texas A&M Research Foundation, called Project 9, from 1947 to 1949 to determine the causes of oyster mortalities in Louisiana. He was familiar with tray monitoring on the Gulf Coast and the discovery of "Dermo" in 1949.

In 1952, Sammy Ray discovered a testing technique for the oyster pathogen, then believed to be a fungus. He used fluid-thioglycollate medium as a growth preparation and Lugol's iodine solution to stain the enlarged prezoosporangial cells ("hypnospores"). This technique

permitted rapid identification of the pathogen using mantle, gill, and rectal tissues to determine the intensity of infections. Dr. Hewatt returned to Virginia every summer for 2 or 3 months throughout the 1950's for joint studies with me (J. D. Andrews). Tray studies were expanded and many oyster samples were tested for "Dermo" from public and private beds throughout Virginia marine waters.

The tray studies were conducted at VIMS pier in the York River from three specially constructed catwalks. For several years, up to 25 trays, each holding initially 100 to 300 oysters, were examined daily for gapers during the warm season (June through October) when "Dermo" kills oysters (see Andrews and Hewatt, 1957). Experience soon taught us that recovery of gapers from planted or natural public oyster beds was difficult. The gapers were essential to demonstrate more intensive infections in dying than in living oysters which proved "Dermo" to be an oyster killer. In retrospect, it is realized that packing oysters densely in trays facilitated "proximity" infections. This resulted in somewhat higher infection levels and greater death rates than are usually experienced on oyster beds where density of oysters may be lower. Furthermore, some infected lots of oysters were always carriedover at VIMS pier from year to year, thereby insuring rapid infection of oysters in new disease-free lots.

Beginning in 1960, the need to separate Dermo-caused mortality from that caused by MSX (Minchinia nelsoni) forced us to design larger, legged trays that could be used away from piers. These could be isolated or set on oyster beds and abandoned grounds near stakes

where interference by "Dermo" was minimal. Isolation of 50 feet between trays in open waters provides 2 or 3 years of freedom from "Dermo" infections depending on the intensity of infective pressure for those years in the area.

The advent of MSX in Chesapeake Bay in 1959 began two decades of reduced activity by Dermo. MSX killed about 90% of the oysters on public rocks and private beds in 2 years (1960-61). Private planting ceased in all waters with salinities above about 15 °/oo including Mobjack Bay, most of the York River, Chesapeake Bay beds in Egg Island and Ocean View areas, and Hampton Bar and Willoughby Spit areas of the lower James River. These areas have not been replanted during 20 years of waiting fruitlessly for MSX activity to subside. These were the prime areas of Dermo activity prior to the arrival of MSX. Most private, rented grounds were not natural oyster beds with reserve shell deposits to provide cultch for catching spatfalls. Oysters and shells tended to sink in the sandy or soft mud bottoms if not dredged in 2 or 3 years. In recent years, I was pulled in SCUBA gear over one-half mile of bottom on Hampton Bar without seeing any oysters, shells or cultch, except occasional hard-clam boxes and downed stakes. The same condition exists in Mobjack Bay where Dermo disappeared in the mid-1960's except at piers on pilings. MSX, by killing nearly all oysters, greatly reduced Dermo activity and isolated remaining infestations to localized areas (Andrews, 1967).

Whereas Dermo has been absent from the open waters of Mobjack Bay for 15 years, it remains quite active in the four tributary rivers to

this large Bay. This is primarily due to fairly regular natural recruitment of oysters rather than private planting of oysters. The rivers are bounded by many piers and some shell beds which serve as reservoirs of disease and foci of infection. This fringe distribution of Dermo is due more to the contiguity of oyster populations than to salinity levels. Low salinities do delay and slow development which may lead to eventual local elimination of the pathogen, but it is a slow process and may be reversed by prolonged droughty and hot summers.

The 1960's were dry with a record drought period from 1963 to 1966. Salinities were correspondingly high. The 1970's were quite wet, in general, with a record tropical-storm flood in June 1972 from Agnes. However, Dermo revived in 1976 and 1980 which shows that it is always present and that it will increase activity when oyster populations are increased in size and density.

II. Life Cycle of *P. marinus* (Dermo)

P. marinus causes a warm-season disease of oysters. It ceases to multiply below about 20°C and gains the greatest physiological advantage over oysters at 25°C or higher. In a population of acclimated oysters, those that had Dermo infections the previous summer, the earliest infections appear in June. These derive from overwintering infections in oysters. The percentage of infections that persist through the cold season is low regardless of the prevalence of cases the previous summer. These infections that appear

in June cause deaths in July and August. The second generation of infections is derived from proximity of oysters to disintegrating gapers from first-generation deaths. The second generation of deaths usually begins in late August. Importations of disease-free oysters from low-salinity James River beds show the first Dermo-caused deaths in late August if held in close proximity to infected lots.

In September and October, the third generation of infections in acclimated oysters is building to a peak level of prevalence for the year. In trays of closely-packed oysters, prevalences may reach 100% infection and often reach 80 to 90%. In this late-summer, early-fall mortality season, advanced infections (heavy and moderate ones) become common, but heavy infections remain low in live-oyster samples because oysters die as fast as new infections become serious ones. At temperatures of 25°C or higher, Dermo kills about one month from time of infection.

Prevalences of Dermo usually peak in October, but temperatures begin falling rapidly thereafter and deaths stop rather abruptly by 1 November when temperatures reach 20°C or lower. The mortality rate drops off quickly at this time although a few oysters with heavy infections die through the late fall and winter.

After 1 November, as water temperatures continue falling, oysters regain physiological advantage over the pathogen. By late December, most light infections are expelled by oysters, and mostly a few advanced infections remain to carry Dermo through the winter. Some

infected oysters die through the winter and other infections are reduced in intensity. There is no evidence to support the theory that hidden stages of Dermo provide for overwintering of the disease. Oysters are inactive for 3 to 3 1/2 months (mid-December to 1 April) at temperatures of 5°C or lower in Virginia and cannot expulse a disease during this period. The prezoosporangia (hypnospores of Mackin) of Dermo were found to be very resistant to cold and freezing (Andrews and Hewatt, 1957).

In the March to May period, live oyster samples often show no Dermo infections by thioglycollate tests. This, I think, reflects the low level of prevalence of overwintering infections. It is quite certain that Dermo does overwinter in Chesapeake Bay, for if infective particles were derived from other sources, all oysters, regardless of past history, would show similar timing of early-summer infections. Also, placing oysters from winter conditions into heated aquaria results in Dermo infections developing in about a month or less.

The seasonal life cycle of P. marinus can be followed in tables of prevalences and intensities of infections in live oysters. In the early years (tables for 1954, 1955, 1956, 1957), native endemic oysters were sampled monthly around the year for thioglycollate tests for Dermo. The longest series were from Hoghouse Bar (Rappahannock River), Hampton Bar (James River), and Ferry Pier pilings (York River) oysters. The first two series consisted of market-sized oysters dredged monthly in areas known to have Dermo infections each summer.

In the tables, note the increases in percentages of infections and the increases in intensity of infections as the warm seasons progressed.

III. Sampling of Live Oysters for Dermo Tests

Over the 30-year period covered in the tables, there were changes in research objectives, therefore, the effort to monitor Dermo activity fluctuated. During the decade of the 1950's, Dermo was the prime objective of research. Extensive sampling of private and public beds throughout Virginia and Eastern Shore of Delmarva Peninsula occurred. Tray studies were essentially confined to VIMS pier where up to 25 trays of oysters from many sources and of all ages were monitored. Nearly all gapers were obtained from VIMS pier trays.

The decade of the 1960's was devoted to study of MSX, and studies of Dermo were incidental to efforts to exclude it as a cause of mortality. The scarcity of planted beds and the vague history of surviving oysters on these beds led to establishment of tray stations throughout Virginia stocked with disease-free oysters imported regularly each year. Fewer Dermo samples were taken and not many from private or public beds. The trays were sampled for Dermo infections and in recent years reliance was placed on getting a few gapers to determine the status of the pathogen.

Due to wet years, scarcity of oysters, and isolation of trays from other oysters, Dermo was less active again in the 1970's. Mostly tray oysters were sampled for Dermo. Some resurgence of the disease has occurred in the late 1970's due to warm falls.

Samples of 25 oysters are minimal for estimating prevalences of a disease organism. When it was important to know the level of Dermo activity, a series of samples was taken to show the trends. (The seasonal trends are quite evident in the tables.) These give reliable information but are not easily amenable to statistical tests. The data are even less exact when percentages of the three intensity categories are considered separately.

In an attempt to devise a category that combined prevalences and intensities, Mackin assigned values of 5, 3, and 1 units for heavy, moderate and light infections. His "weighed incidences" are useful in following the seasonal changes of Dermo. A weighted incidence of 0.50 represents the level at which mortality begins. A value of 1.00 implies moderate deaths and if the value reaches 2.00, which is about the maximum in live oysters, serious losses can result. At VIMS, the narrower intensity categories of 0, 1, 2, 3, 4, and 5 recommended by Ray (1954) have never been used because of variations in diagnosis by individuals. No counts of pathogen cells are made for diagnoses, but the tissues are scanned for general abundances of prezoosporangia in thioglycollate tests. In my opinion, the test is very sensitive for identifiying low intensities of Dermo cells but it depends upon systemic infections, which are usual and typical, for diagnoses. Stained slides are far less sensitive, for diagnoses of light infections are rarely possible.

In taking samples, the age, size and history of the oyster population should always be recorded. Dermo is often not found in

yearling oysters. In sampling a natural bed, mature oysters or those of the largest size or yearclass are usually taken. To understand the level of infection in a bed of planted oysters, the source and age of the planting must be known. After one full year of exposure to Dermo, oysters are considered acclimated to the disease and its full effects under the existing environmental conditions of density of oysters, salinity, temperatures, etc. are demonstrated.

The most important aspects of an oyster bed in regard to Dermo are location in respect to other beds, recruitment of spatfall to maintain populations, and previous history of Dermo infections. It is difficult to impart this knowledge to the reader for assessing the data on Dermo in the tables of live-oyster samples. A map showing the location of most stations has been prepared. The trays of oysters are most difficult because most began as Dermo-free oysters, but the reader needs to know which year of exposure is presented and when the lot was introduced to a Dermo-infested area. Furthermore, the trays in the last two decades have been deliberately isolated from each other and other oysters, when possible, to reduce Dermo infections to a minimum. The reader may consult a chronological list which gives the source and timing of introduction of oysters, mostly James River stocks, or the yearclasses of progeny bred at VIMS.

IV. The Distribution of *P. marinus* in Chesapeake Bay

Dermo has a wide distribution in Virginia. The James River seed area is usually free of Dermo except in the Brown Shoals area just

above the James River Bridge. It has been found as far up as Wreck Shoal in certain years favorable for Dermo. This limited distribution in the seed area is important for transplanting of seed oysters may be a means of introducing Dermo to areas free of the disease. Dermo persists throughout the York River and Mobjack Bay and its tributaries whereever oysters are growing. The old Miles and Ballard rental grounds in the Mobjack Bay area are mostly bare of oysters since planting was stopped beginning in 1961.

Dermo can be found north of the York River in all the tributaries of Chesapeake Bay on the Western Shore, including Milford Haven, the Piankatank River and the Great Wicomico River. It fluctuates in abundance with weather conditions in these areas and seldom exhibits full-scale activity and does not extend up the rivers as far as oysters grow.

The Rappahannock River exhibits light to moderate levels of Dermo activity (usually not above weighted incidence of 0.50). It fluctuates by localities with salinities, oyster recruitment and weather. Since 1972, there have been no drills to kill spat in the Rappahannock River. Once the wet years and low oxygens that accompanied them in the 1970's are eased, recruitment should provide larger populations of oysters for Dermo to thrive on again in the Rappahannock River, as in the 1950's.

The Potomac River shows low prevalences of Dermo primarily on the Maryland side of the river at the mouth of the river just above Point

Lookout. This is the only area of the Potomac River that exhibits regular recruitment of oysters by natural sets. In the 1950's a little Dermo was found as far upriver as Ragged Pt., but oysters are so scarce in the Potomac River that Dermo has little chance to infect them except near Point Lookout. Dermo has been found in Potomac River tributaries where private oyster planting occurs, such as Yeocomico River, but it is not significant in these areas.

The Maryland portion of the Chesapeake Bay on the western side of Eastern Shore exhibits some Dermo in most years. Miss Sally Otto of the Maryland Tidal Fisheries Department has monitored Dermo for many years in Maryland.

The Eastern Shore of Virginia presents an enigma in respect to Dermo. On the Seaside, Dermo is absent and it has been for 30 years. On Bayside, oystering is mostly confined to creeks except in the Pocomoke Sound area. Recruitment of oysters is high on Seaside and usually very low on Bayside. Dermo thrives in all Bayside creeks and Pocomoke Sound when beds of oysters are planted to sustain it. Very little planting has been done on Bayside since MSX and Dermo combined to devastate oyster beds in the early 1960's.

V. Summary of Trends of *P. marinus* Activity in Virginia

In the 1950's, oysters were being harvested in Virginia in the greatest quantities since the early decades of the fishery about 100 years ago. Contributing to this was a high production of seed oysters from James River. These were planted in large acreages of rented

grounds on Hampton Bar, Willoughby Spit bar, Ocean View, Egg Island, Mobjack Bay, and New Point Comfort areas. In addition, many private beds of oysters were planted in the York River, Rappahannock River, and Virginia tributaries of the Potomac River. Pocomoke Sound and Bayside creeks of Eastern Shore were also being planted with James River or Seaside seed oysters.

Most of these extensive planting areas were infested with Dermo in the 1950's except the upper ends of the Bay tributaries above York River and the Potomac area. Mortalities were most regular and destructive from Mobjack Bay and its tributaries south. After the epizootic kills of 1959 to 1961, very few oysters were planted below New Point Comfort at the mouth of the York River. Oysters became scarce in these lower Bay areas and Dermo declined greatly, or disappeared as on Hampton Bar and Mobjack Bay. There was no recruitment of oysters for lack of cultch and mortalities of spat caused by drills. The decline of Dermo is shown in Table 1. There has also been a decline in Dermo in the Rappahannock River due partly to lower salinities but also reduced setting and smaller populations most years (Table 1, Hoghouse Bar). Dermo never was much of a killing agent on the Western Shore above the Rappahannock River.

The Bayside creeks of Eastern Shore and Pocomoke Sound never had consistent setting and they have not been replanted appreciably since MSX destroyed all the planted oysters in the early 1960's.

In studying the prevalence data on tray oysters at VIMS pier, it is important to remember that trays at VIMS pier in the 1950's exposed oysters at high densities to foci of infection continuously maintained from year to year. This almost constituted maximum infection levels that can be obtained under natural conditions in open waters. In contrast, in the 1960's and 1970's, the trays one-half mile above the bridge at Tillages ground area were isolated to achieve minimum infections over several years of exposure. Much depended upon chance infections of one or two oysters in particular trays, and the prevalences of Dermo were not typical of what would be expected on oyster beds for the areas in that year. In fact, there were no oyster beds of consequence in the lower York River in those two decades.

Description of Tray-Monitoring Stations in Virginia

I. Location of James River Oyster Beds

(Disease-free Oysters Obtained from Upper Public Grounds for Control Lots)

1. Darlings Watchhouse, Hampton bar (Flats), about 4 nautical miles above mouth of river; off "Cupola" and above "Tower" on charts designated "piles." Watchhouse removed in 1960's.
2. Nansemond Ridge, public beds above Pig Point towards mouth of Nansemond River, in Hampton Roads.
3. Brown Shoal, shown on charts just above J. R. Bridge on Warwick side of river.
4. Darling's private grounds corner stake inshore of Wreck Shoal at about 8' to 10' depth contour.
5. Wreck Shoal, offshore of Jail Pt. on Mulberry Island; contiguous with and inshore of channel buoy Nun "12."
6. Rainbow Rock, offshore of black buoy "17" towards Point of Shoals.
7. Horsehead Rock, above black buoy "21" on Rocklanding dredged channel at its confluence with the natural channel that turns around Pt. of Shoals.
8. Deep Water Shoal, last public oyster bed upriver above idle fleet and Ft. Eustis Piers. Subject periodically to fresh-water kills of oysters.

Note: Oysters from low-salinity waters (Wreck Shoal to Deep Water Shoal) were used regularly as control lots to monitor MSX and other diseases at numerous stations in Chesapeake Bay and Eastern Shore of Virginia, and also at New Jersey Shellfish Lab. on the Cape May shore of Delaware Bay. At first, Wreck Shoal oysters were used but when they showed MSX in 1960, Horsehead Rock and Deep Water Shoal oysters were used as controls. In the 1970's, following fresh-water kills of oysters on the upper seed beds, it was necessary to use some Wreck Shoal and Rainbow Rock oysters as controls..

II. Location of York River Monitoring Stations

1. Mobjack Bay station, off Bayside below Davis Creek near New Pt. Comfort, near abandoned pier pilings (15' water) at mouth of Mobjack Bay.
2. Ellen Island, survey platform for AMOCO Refinery labelled "obstruction privately maintained" on North side of river opposite refinery. Trays suspended from platform. Also called AMOCO station.
3. VIMS Pier, Lab Pier built in 1950 with 3 special catwalks from which to suspend Chesapeake Corp. 18" x 40" asphalt-covered trays. Shallow waters 3' to 4' deep at low tide, warm in summer.
4. Ferry Pier, old Yorktown-Gloucester Pt. ferry landing below York River Bridge, 8' to 10' depth.
5. Tillage Area, public grounds just offshore Tillage rented ground on northeast shore, 1/2 mile above bridge in 10' to 15' water. Up to 80 trays held adjacent to stakes at spacing of 50' or more.
6. Mt. Folly Pt. on west shore of river opposite Poropotank River, shallow, soft bottom.
7. Roane Pt. at mouth of Poropotank River.
8. Bell Rock, on edge of channel two nautical miles below West Point.

The area around Gloucester Point at the York River bridge is fully endemic both for MSX and Dermo. Salinities seldom go below 14 to 15°/oo and only rarely 10 to 12°/oo during excessive runoffs. In some years, both MSX and Dermo are found to the head of the river (Bells Rock) where the Pamunkey and Mattaponi rivers join to form the York River.

III. Location of Piankatank River Oyster Beds Where Tray-Monitoring Occurred

1. Cherry Pt. Station, on eastern edge of channel due west of Cherry Pt. Often considered equivalent in salinities and disease attributes to mouth of Rappahannock River.

2. Cape Toon public bed, bar thrust out from Burton Pt. with can "7" on its edge.

3. Island Bar, Fishing Bay, mid-river submerged island to west of Fishing Bay.

4. Palace Bar, lower edge of bar extending out to Buoy "9" ("10" formerly?) above Iron Pt.

5. Hole-in-the-Wall, station opposite opening to the Bay, between Breeze Pt. and Sandy Pt.

All of these stations exhibit salinities that are marginally suitable for MSX and Dermo. These pathogens are usually present, but only light to moderate infection levels were found except in the mid-1960's.

IV. Location of Oyster-Monitoring Stations in Rappahannock River

1. Broad Creek station, edge of channel off Broad Creek near Stingray Pt. at mouth of river.

2. Windmill Pt. station, off Windmill Pt. Creek near Windmill Pt. at mouth of Rappahannock River.

3. Parrotts Rock, near channel off Parrotts Island about 2 nautical miles below the Rappahannock River Bridge.

4. Hoghouse Bar, in deep water (up to 40 ft.) between Towles Pt. and Urbanna Creek on western shore.

5. Balls Pt. station, off Balls Pt. near channel, above Urbanna.

6. Bowlers Rock, on west edge of channel below Suggetts Pt. and above Sharps.

MSX and Dermo are mildly active at all stations except number 6. Both are persistent but cause light to moderate mortalities, except in the mid-1960's when MSX killed as far up river as Morattico Bar off Curletts Pt. on Lancaster Creek. Most stations are in deep water and salinities fluctuate only moderately over the oyster-growing zone from season to season.

V. Location of Tray-Monitoring Stations on Seaside of Eastern Shore

1. Outlet Bay, shallow (sometimes intertidal at station) bay west of southern end of Hog Island Bay and running into Great Machipongo Channel.

2. Hog Island Bay station, SE of Willis Wharf along Great Machipongo Channel on Terry rented ground. Station serviced by Buzz Terry for many years with exemplary performance. Most important oyster-growing area on Seaside of Virginia.

3. Swash Bay, inshore of Parramore Island.

4. Bradford Bay, close in to Wachapreague, Va. shallow bay and rather exposed. Water exchanged at Wachapreague Inlet with ocean.

5. Chincoteague Bay station, western shore near Sinnickson Creek below Cockle Pt. in Virginia. Shallow.

These are all SSO areas with increasing mortality from MSX since about 1975. No Dermo is found on Seaside. Compared to bay stations in large deep rivers, these stations are all very shallow. All are high-salinity waters, usually 30°/oo or higher. Ice damage to trays in shallow waters is a problem some winters. Hog Island Bay station was dropped in 1975 for financial reasons (unwisely) and only Swash Bay and Chincoteague Bay were continued as long-term stations.

VI. Location of Tray-Monitoring Stations on on Bayside of Eastern Shore

1. Cherrystone Inlet - near mouth.

2. The Gulf - inside entrance bar.

3. Hungars Creek - near mouth.

4. Occohannock Creek

5. Nandua Creek

6. Chesconessex Creek

7. Messongo Creek

These stations were utilized only the first few years after MSX invaded Virginia waters in 1959-60. Thereafter, only Cherrystone Inlet and The Gulf were sites of tray-monitoring of oysters. Since oystering virtually ceased in Bayside creeks after the MSX kills, all stations were discontinued after 1975 due to financial constraints. No Dermo or MSX was found in Bayside creek samples in 1979. Dermo would rebound if oysters were planted there again and MSX activity would depend mostly on weather and sources of infective particles now at low ebb.

Lists of Trays of Oysters Monitored for Diseases in Virginia on Natural Beds, 1959 to 1980

(Wreck Shoal, Rainbow, Horsehead, and Deep Water Shoal oysters believed to be free of diseases when transplanted to monitoring stations - see descriptions of tray sites in Table 13)

Tray No.	Date Lot Initiated	Source of Oysters and Monitoring Station	Date Tray Closed	
		Trays Monitored in James River		
J-1	26 May 59	Wreck Shoals at Wreck Shoals	8 Sep 64	
J-2	1 Apr 60	Brown Shoals at Brown Shoals	14 Apr 65	
J-3	15 Feb 61	Wreck Shoals at Darling Corner	15 Nov 62	
J-4	21 May 59	Hampton Bar at Hampton Bar	25 Oct 60	
J-5	21 May 59	Wreck Shoals at Hampton Bar	14 Aug 61	
J-6	15 Mar 60	Wreck Shoals at Hampton Bar	14 Dec 61	
J-7	9 Mar 61	Horsehead at Hampton Bar	13 Nov 61	
J-8	24 Feb 61	Horsehead at Horsehead	3 Jan 64	
J-9	6 Nov 61	Mobjack Spat to Inshore Wreck Shoals	15 Nov 62	
J-9 A	28 Mar 61	Wreck Shoals at Deep Water Shoals	5 Jun 61	
J-10	7 May 63	Wreck Shoals at Hampton Bar	19 Sep 63	
J-11	16 May 63	Brown Shoals at Brown Shoals	10 Apr 64	
J-12	16 Apr 64	Horsehead at Hampton Bar	29 Dec 65	
J-13	15 Apr 64	Horsehead at Wreck Shoal	15 Mar 67	
J-14	17 Mar 64	Horsehead at Hampton Bar	24 Jul 67	
J-15	7 Apr 66	Horsehead at Brown Shoal	1 Jun 67	
J-16	17 Jun 66	Deep Water Shoal at Wreck Shoal	31 Oct 69	VIMS
J-17	12 Apr 67	Horsehead at Darling Corner	5 Jun 68	
J-18	12 Apr 67	Horsehead at Hampton Bar	7 Jun 68	
J-19	14 Apr 67	Potomac at Darling Corner	7 Mar 70	
J-20	5 Jun 68	Wreck Shoals at Brown Shoals	13 Nov 69	
J-21	5 Jun 68	Wreck Shoals at Hampton Bar	10 Sep 69	lost
J-22	22 Apr 70	Horsehead at Hampton Bar	18 Dec 70	
J-23	22 Apr 70	Horsehead at Brown Shoals	18 Dec 70	
J-24	22 Apr 70	Deep Water Shoals at Wreck Shoals	18 Dec 70	lost
J-25	12 Apr 71	Deep Water Shoals at Hampton Bar	4 Nov 71	
J-26	12 Apr 71	Deep Water Shoals at Brown Shoals	28 Dec 71	
J-27	12 Mar 71	Deep Water Shoals at Wreck Shoals	28 Dec 71	
J-28	1 May 72	Horsehead at Hampton Bar	24 Nov 72	
J-29	2 May 72	Horsehead at Brown Shoals	4 Oct 72	
J-30	2 May 72	Horsehead at Wreck Shoals	24 Nov 72	
J-31	29 Mar 73	Wreck Shoals at Hampton Bar	12 Nov 73	
J-32	29 Mar 73	Wreck Shoals at Brown Shoals	12 Nov 73	
J-33	29 Mar 73	Wreck Shoals at Wreck Shoals	12 Nov 73	
J-34	3 Apr 74	Horsehead at Hampton Bar	18 Oct 74	
J-35	3 Apr 74	Wreck Shoals at Brown Shoals	4 Jun 74	lost
J-36	3 Apr 74	Wreck Shoals at Wreck Shoals	29 Jul 74	lost
J-37	5 Mar 75	Rainbow Rock at Hampton Bar	29 Oct 75	

Tray No.	Date Lot Initiated	Source of Oysters and Monitoring Station	Date Tray Closed	
J-38	5 Mar 75	Rainbow Rock at Brown Shoals	29 Oct 75	
J-39	5 Mar 75	Rainbow Rock at Wreck Shoals	29 Oct 75	
J-40	11 May 76	Wreck Shoals at Hampton Bar	Jan 77	lost
J-41	11 May 76	Wreck Shoals at Brown Shoals	Jan 77	lost
J-42	11 May 76	Wreck Shoals at Wreck Shoals	Jan 77	lost
J-43	3 May 77	Point of Shoals at Hampton Bar	22 Apr 80	
J-44	3 May 77	Point of Shoals & Wreck Shoals at Brown Shoals	22 Apr 80	
J-45	3 May 77	Wreck Shoals at Wreck Shoals	9 Dec 77	
J-46	13 Mar 78	Rainbow Rock at Hampton Bar	30 Jun 80	
J-47	13 Mar 78	Rainbow Rock at Brown Shoals	combined w/J-46	
J-48	13 Mar 78	Rainbow Rock at Wreck Shoals	30 Mar 79	
J-49	20 Mar 79	Horsehead at Hampton Bar	16 Jul 80	
J-50	20 Mar 79	Horsehead at Brown Shoals	22 Oct 79	lost
J-51	20 Mar 79	Horsehead at Wreck Shoals	9 Jul 80	
J-52	8 Apr 80	Horsehead at Hampton Bar	3 Nov 80	
J-53	8 Apr 80	Horsehead at Brown Shoals	3 Nov 80	
J-54	8 Apr 80	Horsehead at Wreck Shoals	3 Nov 80	
		Trays Monitored in York River		
Y-1	27 May 59	Wreck Shoal at Mt. Folly	30 Nov 62	
Y-2	27 May 59	Seaside at Mt. Folly	21 Feb 62	
Y-3	14 Mar 59	Wreck Shoals at Tillages	10 May 60	
Y-4	22 Jul 59	Wreck Shoals at Tillages	10 May 60	
Y-5	25 Jul 59	Wreck Shoals at Tillages	10 May 60	
Y-6	11 Mar 59	Wreck Shoals at Ellen Is.	16 Oct 59	
Y-7	11 Mar 59	Wreck Shoals at Ellen Is.	16 Oct 59	
Y-8	9 Mar 59	Wreck Shoals at Roane Pt.	3 Apr 60	
Y-9	25 Nov 59	Wreck Shoals at Amoco Sta.	16 Dec 60	
Y-10	23 Feb 60	Wreck Shoals at Tillages	3 Apr 62	
Y-11	23 Feb 60	Wreck Shoals at Amoco Sta.	2 Mar 61	
Y-12	23 Feb 60	Wreck Shoals Acclimated at Amoco Tower	10 Apr 63	
Y-13	30 Mar 60	Wreck Shoals at Tillages	16 Dec 60	
Y-14	2 Mar 61	Horsehead at Tillages	15 Apr 64	
Y-15	6 Apr 62	Horsehead at Tillages	2 Feb 67	
Y-16	5 Mar 63	Horsehead at Amoco	16 Jun 65	
Y-17	9 Apr 63	Horsehead at Tillages	31 Mar 65	
Y-18	3 Jun 65	Horsehead at Tillages	21 Mar 66	
Y-19	12 Mar 64	Horsehead at Tillages	28 Jul 65	
Y-20	14 Jul 64	Horsehead off VIMS	20 Oct 65	
Y-21	14 Sep 64	Horsehead at Tillages	21 Mar 66	
Y-22	5 Apr 65	Horsehead at Tillages	31 May 68	
Y-23	5 Apr 65	Horsehead off VIMS	16 Dec 65	
Y-24	13 Apr 65	Mobjack Bay Survivors at Tillages	18 Dec 70	
Y-25	24 Aug 65	Horsehead at Tillages	23 Jan 66	
Y-26	18 Feb 66	Horsehead at Tillages	15 Sep 65	
Y-27	10 Mar 66	Deep Rock (Gwynns Island to off VIMS)	24 Jul 68	

Tray No.	Date Lot Initiated	Source of Oysters and Monitoring Station	Date Tray Closed
Y-28	11 Apr 66	Horsehead off VIMS	31 May 68
Y-29	20 Apr 66	Horsehead at Amoco Sta.	7 Jun 67
Y-30	13 Jun 66	Mass. Oysters off VIMS	16 Aug 67
Y-31	29 Jun 66	Potomac River, Beacon Bar off VIMS	13 Mar 67
Y-32	29 Jun 66	Potomac River, Beacon Bar off VIMS	14 Jul 67
Y-33	27 Jul 66	York River (Ferry Pier Oysters) off VIMS	7 Nov 68
Y-34	18 Aug 66	Deep Water Shoals at Tillages	3 Jul 68
Y-35	18 Aug 66	Deep Water Shoals off VIMS	22 Aug 67
Y-36	20 Mar 67	Horsehead off VIMS	7 Nov 68
Y-37	20 Mar 67	Horsehead at Tillages	6 Jun 68
Y-38	23 Mar 67	1966 Strike James River off VIMS	7 Apr 69
Y-39	20 Mar 67	1966 Yearclass Horsehead off VIMS	6 Jun 68
Y-40	14 Apr 67	Potomac River at Tillages	Dec 68
Y-41	14 Apr 67	Potomac River at Tillages	6 Feb 68
Y-42	27 Jun 67	Horsehead Oysters at VIMS	3 Jul 68
Y-43	21 Aug 67	Deep Water Shoals off VIMS	Jun 69
Y-44	7 Sep 67	Potomac off VIMS (Beacon Bar Oysters)	26 Aug 68
Y-45	7 Sep 67	Potomac off Tillages (Beacon Bar Oysters)	9 Jun 69
Y-46	13 Sep 67	Deep Water Shoals off VIMS	27 Sep 68
Y-47	13 Mar 68	Deep Water Shoals at Tillages	1 May 69
Y-48	15 Mar 68	Deep Water Shoals off VIMS	1 Dec 69
Y-49	29 Apr 68	Potomac River off VIMS	7 Nov 69
Y-50	29 Apr 68	Potomac River off VIMS	8 Oct 69
Y-51	29 Apr 68	Potomac River off VIMS	14 Mar 69
Y-52	3 Jun 68	Horsehead off VIMS	5 Sep 68
Y-53	26 Jun 68	Beacon Bar off VIMS	9 Dec 69
Y-54	29 Aug 68	Horsehead off VIMS	1 Jun 70
Y-55	1 Apr 69	Horsehead off VIMS	1 Jun 70
Y-56	1 Apr 69	Horsehead at Tillages	4 Jun 69
Y-57	3 Jul 69	Piankatank 68 Set off VIMS	16 Sep 70
Y-58	14 Jul 69	Deep Rock Powell's Lab Set Jul 68 at Tillages	14 May 71
Y-59	14 Jul 69	Deep Rock Powell's Lab Set Aug 68 off VIMS	10 Apr 70
Y-60	Dec 69	Manokin R. (MD) Shellbag Set off VIMS	12 Jul 73
Y-61	12 Mar 70	Horsehead at Tillages	28 Jul 71
Y-62	12 Mar 70	Horsehead off VIMS	28 Jul 71
Y-63	14 May 70	Deep Water Shoals off VIMS	20 Jul 73
Y-64	23 Jul 70	Deep Water Shoals off VIMS	12 Oct 71
Y-65	2 Sep 70	Wreck Shoals off VIMS	17 May 71
Y-66	24 Sep 70	Manokin R. (MD) Strike off Tillages	11 Sep 73
Y-67	20 Oct 70	NJ ASY-BB at Tillage	25 Jun 76
Y-68	20 Oct 70	NJ ASV-EE at Tillage	25 Jun 76
Y-69	18 Mar 71	Deep Water Shoals off VIMS	22 Nov 74
Y-70	18 Mar 71	Deep Water Shoals at Tillages	17 May 72
Y-71	14 Jun 71	Deep Water Shoals at Tillages	16 Jun 71
Y-72	20 Sep 71	Horsehead & Deep Water Shoals at VIMS Pier	7 Aug 72

Tray No.	Date Lot Initiated	Source of Oysters and Monitoring Station	Date Tray Closed
Y-73	20 Mar 72	Horsehead Oysters off VIMS	2 Nov 73
Y-74	20 Mar 72	Horsehead Oysters off Tillages	2 Nov 74
Y-75	13 Apr 72 & 23 May 72	Potomac River off Tillages	6 Apr 73
Y-76	27 Mar 73	Horsehead off VIMS	26 Jun 74
Y-77	27 Mar 73	Horsehead at Tillages	17 May 74
Y-78	1 Apr 73 & 15 May 73	Wreck Shoal at Tillages	30 May 74
Y-79	29 Aug 73	Wreck Shoals at Tillages	2 Aug 74
Y-80	26 Mar 74	Horsehead off VIMS	18 Jun 75
Y-81	26 Mar 74	Horsehead at Tillages	13 Dec 74
Y-82	29 Aug 74	Wreck Shoals at Tillages	7 Jul 76
Y-83	7 Mar 75	Horsehead at Tillages	7 Jul 76
Y-84	7 Mar 75	Rainbow Rock at Tillages	26 Jul 76
Y-85	26 Aug 75	Horsehead at Tillages	13 May 76
Y-86	26 Aug 75	Wreck Shoals at Tillages	4 Nov 77
Y-87	4 Mar 76	Rainbow Rock at Tillages	4 Nov 77
Y-88	4 Mar 76	Wreck Shoals at Tillages	16 Jul 80
Y-89	15 Jul 76	Point of Shoals at Tillages	Jan 77 lost
Y-90	1 Sep 76	Point of Shoals at Tillages	11 Oct 79
Y-91	24 Sep 76	Horsehead at Tillages	24 Apr 79
Y-92	8 Mar 77	Point of Shoals at Tillages	11 Oct 79
Y-93	8 Mar 77	Point of Shoals at Tillages	4 Nov 77
Y-94	13 Jun 77	Rainbow Rock at Tillages	24 Apr 79
Y-95	17 Aug 77	Rainbow Rock at Tillages	26 Mar 80
Y-96	11 Oct 77	Rainbow Rock at Tillages	11 Oct 79
Y-97	24 Mar 78	Horsehead at Tillages	20 Nov 80
Y-98	13 Mar 78	Horsehead at Tillages	26 Jun 80
Y-99	13 Mar 78	Rainbow Rock at Tillages	20 Nov 80
Y-100	13 Mar 78	Rainbow Rock at Tillages	Active
Y-101	28 Aug 78	Rainbow Rock at Tillages	26 Jun 80
Y-102	15 Sep 78	Sarah's Cr. Set 1975 at Tillages	20 Nov 80
Y-103	20 Mar 79	Horsehead at Tillages	8 Dec 80
Y-104	20 Mar 79	Horsehead at Tillages	26 Mar 80
Y-105	20 Mar 79	Horsehead at Tillages	Active
Y-106	6 Aug 79	Horsehead at Tillages	Active
Y-107	26 Sep 79	Horsehead at Tillages	Active
Y-108	20 Mar 80	Horsehead at Tillages	8 Dec 80
Y-109	20 Mar 80	Horsehead at Tillages	Active
Y-110	20 Mar 80	Horsehead at Tillages	Active
		Trays Monitored in Mobjack Bay	
MJ-1	25 Nov 59	Wreck Shoals Seed off Davis Creek	4 May 62
MJ-2	9 Dec 59	Wreck Shoals Seed off Davis Creek	25 Oct 64
MJ-3	22 Jun 60	Acclimated James R. Oysters at Mobjack	19 Aug 60
MJ-4	22 Jun 61	Acclimated James R. Oysters at Mobjack	2 Mar 61
MJ-5	2 Mar 61	Horsehead at Mobjack	18 Dec 62 lost

Tray No.	Date Lot Initiated	Source of Oysters and Monitoring Station	Date Tray Closed	
MJ-6	19 Mar 62	Horsehead at Mobjack	5 Jun 69	
MJ-7	21 Sep 62	Horsehead at Mobjack	4 Sep 64	
MJ-8	6 Feb 63	James R. Plants (Miles) at Mobjack	11 Dec 63	
MJ-9	8 Apr 63	Horsehead at Mobjack	5 May 65	
MJ-10	10 Sep 63	Horsehead at Mobjack	5 May 65	
MJ-11	15 Apr 64	Horsehead at Mobjack	23 Jul 65	
MJ-12	11 Sep 64	Horsehead at Mobjack	14 Jan 66	
MJ-13	5 Apr 65	Horsehead at Mobjack	29 Aug 66	
MJ-14	16 Aug 65	Horsehead at Mobjack	7 Apr 67	
MJ-15	18 Feb 66	Horsehead at Mobjack	24 Jul 68	
MJ-16	31 Mar 67	Horsehead at Mobjack	20 May 69	
MJ-17	12 Apr 67	Potomac at Mobjack	13 Jun 68	
MJ-18	15 Mar 68	Deep Water Shoals at Mobjack	17 Apr 69	
MJ-19	29 Apr 68	Potomac at Mobjack	30 Jun 69	
MJ-20	25 May 69	Deep Water Shoals at Mobjack	30 Dec 69	
MJ-21	12 Mar 70	Horsehead at Mobjack	20 Nov 70	
MJ-22	13 Apr 71	Deep Water Shoals at Mobjack	29 Mar 72	
MJ-23	20 Mar 72	Horsehead at Mobjack	16 Jan 73	
MJ-24	28 Mar 73	Horsehead at Mobjack	8 Jan 74	
MJ-25	26 Mar 74	Horsehead at Mobjack	30 Dec 74	
MJ-26	6 Mar 75	Rainbow at Mobjack	7 Nov 75	
MJ-27	4 Mar 76	Wreck Shoals at Mobjack	Jan 77	
MJ-28	8 Mar 77	Point of Shoals at Mobjack	19 Apr 78	
MJ-29	13 Mar 78	Rainbow Rock at Mobjack	1 Sep 78	lost
MJ-30	20 Mar 79	Horsehead at Mobjack	2 Jun 80	
MJ-31	20 Mar 80	Horsehead at Mobjack	12 Sep 80	
		Trays Monitored in Rappahannock River		
R-1	6 Jul 59	Native Oysters at Bowlers Rock	22 Nov 60	
R-2	14 Mar 59	James R. at Hoghouse Bar	29 Apr 60	
R-3	1 Jun 59	Native Oysters at Hoghouse Bar	25 Jul 61	
R-4	22 Jul 59	James R. at Hoghouse Bar	31 May 60	
R-5	22 Jul 59	James R. at Hoghouse Bar	31 May 60	
R-6	23 Feb 60	Wreck Shoals at Hoghouse Bar	25 Jul 61	
R-7	30 Mar 60	James R. at Hoghouse Bar	20 Feb 61	
R-8	9 Mar 61	Horsehead at Hoghouse Bar	25 Jul 61	
R-9	23 Aug 61	Native Oysters at Hoghouse Bar	18 May 62	
R-10	30 Aug 61	Old Native Oysters at Bowlers Wharf	28 Aug 67	
R-11	5 Jun 62	Native Oysters at Hoghouse Bar	11 Aug 65	
R-12	15 Apr 66	Horsehead at Hoghouse Bar	17 May 67	
R-13	31 Mar 67	Horsehead at Hoghouse Bar	28 Aug 67	
R-14	9 Jul 68	Potomac at Broad Creek	12 Nov 69	lost
R-15	16 May 69	Deep Water Shoals at Broad Creek	28 Apr 70	
R-20	24 Apr 70	Deep Water Shoals at Broad Creek	13 Nov 70	
R-21	24 Apr 70	Deep Water Shoals at Broad Creek	13 Nov 70	
R-22	24 Apr 70	Deep Water Shoals at Balls Point	13 Nov 70	
R-23	24 Apr 70	Deep Water Shoals at Balls Point	13 Nov 70	

Tray No.	Date Lot Initiated	Source of Oysters and Monitoring Station	Date Tray Closed
R-25	14 Apr 71	Deep Water Shoals at Broad Creek	29 Dec 71
R-26	20 May 71	Deep Water Shoals at Balls Point	30 Dec 71
R-27	1 May 72	Horsehead at Broad Creek	18 Dec 72
R-28	1 May 72	Horsehead at Balls Point	18 Jan 73
R-29	1 Apr 73	Wreck Shoals at Windmill Point	23 Nov 73
R-30	1 Apr 73	Wreck Shoals at Balls Point	23 Oct 74
R-31	26 Mar 74	Horsehead at Parrotts Rock	23 Oct 74
R-32	6 Mar 75	Rainbow Rock at Parrotts Rock	5 Nov 75
R-33	6 Mar 75	Rainbow Rock at Balls Point	5 Nov 75
R-34	4 Mar 76	Wreck Shoals at Parrotts Rock	Jan 77 lost
R-35	4 Mar 76	Wreck Shoals at Balls Point	Jan 77 lost
R-36	8 Mar 77	Point of Shoals at Parrotts Rock	8 Dec 77
R-37	8 Mar 77	Point of Shoals at Balls Point	22 Sep 77 lost
R-38	13 Mar 78	Rainbow Rock at Parrotts Rock	3 Nov 78 lost
R-39	13 Mar 78	Rainbow Rock at Balls Point	22 Mar 79 lost
R-40	22 Mar 79	Horsehead at Parrotts Rock	4 Dec 79
R-41	22 Mar 79	Horsehead at Balls Point	26 Jun 80
R-42	2 Apr 80	Horsehead at Parrotts Rock	8 Oct 80
R-43	2 Apr 80	Horsehead at Balls Point	5 Nov 80
		Trays Monitored in Piankatank River	
PK-1	4 Jun 68	Horsehead at Cape Toon	13 May 69 lost
PK-2	15 May 69	Horsehead in Piankatank	24 Jun 69 lost
PK-3	24 Apr 70	Deep Water Shoals at Buoy 10	11 Jun 69 mud?
PK-4	24 Apr 70	Deep Water Shoals at Buoy 10	30 Jul 70 lost
PK-5	13 Apr 71	Deep Water Shoals at Cherry Pt.	29 Dec 71
PK-6	13 Apr 71	Deep Water Shoals at Fishing Bay	29 Dec 71
PK-7	20 May 71	Deep Water Shoals at Hole-in-Wall	29 Dec 71
PK-7 A	5 May 72	Horsehead at Burtons Pt.	18 Dec 72
PK-8	1 May 72	Horsehead at Cherry Pt.	18 Dec 72
PK-9	1 Apr 73	Wreck Shoals at Cherry Pt.	23 Nov 73
PK-10	26 Mar 74	Horsehead at Cherry Pt.	23 Oct 74
PK-11	6 Mar 75	Rainbow Rock at Cherry Pt.	5 Nov 75
PK-12	4 Mar 76	Wreck Shoals at Cherry Pt.	Jan 77 lost
PK-13	8 Mar 77	Point of Shoals at Cherry Pt.	8 Dec 77
PK-14	13 Mar 78	Rainbow Rock at Cherry Pt.	22 Mar 79
PK-15	22 Mar 79	Horsehead at Cherry Pt.	4 Dec 79
PK-16	2 Apr 80	Horsehead at Cherry Pt.	6 Nov 80
		Trays Monitored in Nomini Creek on the Potomac River, Severn River and Little Wicomico River	
N-1	19 May 59	Wreck Shoal Oysters at Nomini Creek	30 Jun 65
N-2	19 May 59	Local James R. Plants at Nomini Creek	14 Aug 63
N-3	18 Jul 63	James River Plants at Nomini Creek	30 Jun 65
SV-1	25 Aug 59	Native Oysters at Severn River	6 Mar 61
LW-1	4 Jun 59	Wreck Shoals at Spriggs, Ltl Wicomico R.	24 Oct 60

List of Oyster Trays Monitored on Seaside
Eastern Shore, Virginia 1959-80

Tray No.	Location of Tray	Source of Oysters	Date Initiated	Date Closed	Combined with Tray
		1959 New Trays			
S1	Cobb Is. Bay	natives	26 Feb 59	21 Oct 60	lost
S2	Cobb Is. Bay	natives	26 Feb 59	6 Sep 60	S1
S3	Hog Is. Bay	Wreck Shoals	26 Feb 59	29 May 61	
S4	Hog Is. Bay	natives	26 Feb 59	21 Aug 62	S9
S5	Hog Is. Bay	natives	26 Feb 59	13 Jan 61	S4
S6	Willis Wharf	Machipongo R.	6 Mar 59	18 May 61	
S7	Outlet Bay	Wreck Shoals	15 May 59	2 Feb 61	
S8	Outlet Bay	Delaware Bay	15 May 59	14 Jun 61	
S9	Swash Bay	natives	5 Mar 59	30 Nov 65	
S10	Swash Bay	natives	5 May 59	10 Oct 60	S9
S11	Machipongo R.	Horsehead	15 Jun 59	28 Feb 61	
S12	Cobb Is. Bay	Horsehead	16 Jun 59	2 Nov 60	to Gl.Pt.
S13	Swash Bay	Horsehead	16 Jun 59	4 Jan 61	
S14	Machipongo R.	natives	15 Jun 59	24 Feb 61	
		1960 New Trays			
S15	Swash Bay	Wreck Shoals	24 Feb 60	13 Jun 61	
S16	Hog Is. Bay	Machipongo R.	29 Sep 60	14 Nov 61	S17
S17	Hog Is. Bay	Machipongo R.	29 Sep 60	2 Dec 63	S33
S18	Parting Cr.	Machipongo R.	10 Oct 60	23 Jul 62	S17
S19	Swash Bay	natives	2 Dec 60	2 Dec 63	S9
S20	Swash Bay	natives	2 Dec 60	26 Jul 61	S19
S21	Swash Bay	Wachapreague 1960	3 Dec 60	30 Nov 65	
S22	Swash Bay	Horsehead	6 Nov 60	15 May 63	S10
S23	Bradfords Bay	Wreck Shoals	15 Nov 60	5 Oct 61	
		1961 New Trays			
S24	Bradfords Bay	Mobjack Bay Pl.9	9 Feb 61	5 Oct 61	
S25	Bradfords Bay	Wreck Shoals	20 Apr 61	13 Aug 62	
S26	Bradfords Bay	Hog Is. Bay	28 Apr 61	13 Aug 62	
S27	Swash Bay	Bradfords Bay	30 Mar 61	30 Jul 62	
S28	Swash Bay	Horsehead	1 Aug 61	30 Jul 62	S29
S29	Swash Bay	Horsehead	2 Sep 61	15 Dec 66	S21
S30	Bradfords Bay	Drawing Channel	28 Sep 61	16 Apr 62	
S31	Occohannock Cr.	Survivors B 21	28 Sep 61	16 Apr 62	
S32	Parting Cr.	Machipongo R.	14 Nov 61	1 Dec 65	S33
S33	Hog Is. Bay	Machipongo R. 60	14 Nov 61	15 Jun 63	to Wach.
S34	Hog Is. Bay	Horsehead	14 Nov 61	15 Jun 63	
S35	Swash Bay	Wachapreague 61	4 Dec 61	15 Jul 71	

Tray No.	Location of Tray	Source of Oysters	Date Initiated	Date Closed	Combined with Tray
		1962 New Trays			
S36	Bradfords Bay	Wreck Shoals	27 Mar 62	15 May 63	S10
S37	Bradfords Bay	Long Island	4 May 62	24 Jan 67	
S38-S40 & S42 no record					
S41	Hog Is. Bay	Machipongo R.	31 Oct 62	15 Apr 70	S44
		1963 New Trays			
S43	Hog Is. Bay	Wreck Shoals	2 Apr 63	31 Mar 70	
S44	Hog Is. Bay	natives 61	Nov 63	3 Sep 74	to Wach.
		1964 New Trays			
S45	Hog Is. Bay	Machipongo R.	31 Apr 64	15 Apr 70	S44
S46	Swash Bay	Horsehead	21 May 64	15 Apr 70	
S47	Swash Bay	natives	16 Sep 64	3 Sep 74	to Wach.
S48	Hog Is. Bay	Wreck Shoals	17 Sep 64	3 Sep 74	to Wach.
S49	Hog Is. Bay	Machipongo R. 63	28 Dec 64	17 Jun 68	
		1965 New Trays			
S50	Swash Bay	Horsehead	4 May 65	15 Apr 70	
S51	Swash Bay	Horsehead	3 Dec 65	3 Jun 68	
S52	Swash Bay	natives 64	6 Dec 65	2 Jul 68	
S53	no record				
S54	Hog Is. Bay	Machipongo R.	1 Dec 65	30 Jun 69	
S55	Hog Is. Bay	Horsehead	3 Dec 65	2 Jul 68	
S56	Swash Bay	Chincoteague 60	6 Dec 65	30 Jun 69	
S57	Chincoteague	Horsehead	3 Dec 65	3 Jan 67	stolen
S58	Chincoteague	natives	3 Dec 65	3 Jan 67	stolen
S59	no record				
		1966 New Trays			
S60	Hog Is. Bay	natives 65	28 Nov 66	30 Jun 69	
S61	no record				
		1967 New Trays			
S62	Chincoteague	natives	27 Jan 67	30 Jun 69	
S63	Swash Bay	Burton Bay, Piank	30 Dec 66	30 Jun 69	
		1968 New Trays			
S64	Chincoteague	natives 67	2 Jan 68	16 Jun 69	
S65	Swash Bay	natives 67	27 Nov 67	17 Aug 70	
S66	no record				
S67	Hog Is. Bay	Machipongo R.	29 Dec 67	30 Sep 70	

Tray No.	Location of Tray	Source of Oysters	Date Initiated	Date Closed	Combined with Tray
S68	Swash Bay	Deep Water Shoal	1 May 68	17 Aug 70	
S69	Hog Is. Bay	Deep Water Shoal	2 May 68	30 Jun 69	
		1969 New Trays			
S70	Hog Is. Bay	Machipongo R. 67	12 Nov 68	1 Mar 71	
S71	Chincoteague	natives	30 Dec 68	18 Sep 70	
S72	Swash Bay	natives	2 Jan 69	1 Sep 70	
		1970 New Trays			
S73	Hog Is. Bay	Machipongo R.	15 Nov 69	1 Sep 71	
S74	Swash Bay	natives	2 Mar 70	28 Jun 71	
S75	Chincoteague	natives	4 Mar 70	1 Jul 71	
S76	Hog Is. Bay	Horsehead	12 Mar 70	30 Mar 71	lost
S77	Swash Bay	Horsehead	27 May 70	28 Jun 71	
		1971 New Trays			
S78	Chincoteague	natives	10 Nov 70	1 Sep 72	
S79	Swash Bay	Horsehead	10 Nov 70	20 Nov 72	
S80	Hog Is. Bay	Horsehead	10 Nov 70	15 Jul 71	
S81	Chincoteague	Horsehead	10 Nov 70	21 Nov 72	
S82	Swash Bay	natives	13 Nov 70	20 Nov 72	
S83	Hog Is. Bay	Machipongo R.	12 Nov 70	30 Nov 72	
S84	Hog Is. Bay	Deep Water Shoal	17 Apr 71	30 Nov 72	
		1972 New Trays			
S85	Hog Is. Bay	Machipongo R.	30 Dec 71	15 Aug 73	
S86	Swash Bay	natives	6 Mar 72	15 Aug 73	
S87	Chincoteague	natives	20 Mar 72	17 Aug 73	
S88	Chincoteague	Horsehead	4 May 72	8 Jun 73	
S89	Swash Bay	Horsehead	5 May 72	15 Aug 73	
S90	Hog Is. Bay	Horsehead	4 May 72	30 Jun 73	
		1973 New Trays			
S91	Swash Bay	natives	1 Dec 72	15 Aug 73	
S92	Hog Is. Bay	Machipongo R.	22 Nov 72	3 Aug 74	
S93	Chincoteague	natives	21 Dec 72	4 Sep 74	
S94	Hog Is. Bay	Wreck Shoals	21 May 73	31 Aug 74	
S95	Chincoteague	Wreck Shoals	31 May 73	4 Sep 74	
S96	Swash Bay	Wreck Shoals	27 Jun 73	3 Sep 74	

Tray No.	Location of Tray	Source of Oysters	Date Initiated	Date Closed	Combined with Tray
		1974 New Trays			
S97	Hog Is. Bay	Machipongo R.	20 Dec 73	9 Jul 75	
S98	Hog Is. Bay	Horsehead	10 May 74	9 Jul 75	
S99	Swash Bay	Horsehead	10 May 74	5 Aug 75	
S100	Chincoteague	Horsehead	10 May 74	10 Oct 75	
		1975 New Trays			
S101	Hog Is. Bay	natives	31 Dec 74	9 Jul 75	
S102	no record				
		1976 New Trays			
S103	Chincoteague	natives	10 Oct 75	4 Jan 78	
S104	Swash Bay	natives	19 Nov 75	28 Jun 77	
S105	Bradfords Bay	Wreck Shoals	14 May 76	28 Jun 77	
S106	Bradfords Bay	Pt. of Shoals	19 Jul 76	28 Jun 77	
		1977 New Trays			
S107	Chincoteague	Pt. of Shoals	4 May 77	9 Dec 78	S108
S108	Swash Bay	Pt. of Shoals	21 Mar 77	31 May 79	
S109	Chincoteague	natives	16 May 77	1 Mar 79	lost
S110	Swash Bay	natives	3 Jun 77	1 Dec 78	S111
S111	Bradfords Bay	natives	3 Jun 77	16 Oct 79	S116
		1978 New Trays			
S112	Swash Bay	Rainbow Rock	17 Apr 78	1 Jul 80	
S113	Swash Bay	P174, MSX-Resist.	17 Apr 78	15 Jun 79	
S114	Chincoteague	Rainbow Rock	17 Apr 78	1 Aug 79	S112
S115	Chincoteague	natives	17 Apr 78	1 Mar 79	lost
S116	Bradfords Bay	natives	17 Apr 78		active
S117	Swash Bay	natives	17 Apr 78	16 Oct 79	S116
		1979 New Trays			
S118	Chincoteague	Horsehead	4 Apr 79	1 Jul 80	
S119	Swash Bay	Horsehead	4 Apr 79	1 Jul 80	
S120	Swash Bay	P173A, MSX-Resist.	27 Apr 79	3 Jun 80	
S121	Swash Bay	natives	18 Jun 79	2 Dec 80	
S122	Chincoteague	natives	20 Jun 79	2 Dec 80	
S123	Swash Bay	P194 & P195 MSX-Resist.	4 Oct 79		active
S124	Chincoteague	P196 & P197 MSX-Resist.	4 Oct 79		active

Tray No.	Location of Tray	Source of Oysters	Date Initiated	Date Closed	Combined with Tray
		1980 New Trays			
S125	Chincoteague	natives	16 Apr 80		active
S126	Chincoteague	Horsehead	16 Apr 80		active
S127	Bradfords Bay	natives	1 May 80		active
S128	Swash Bay	natives	1 May 80		
S129	Swash Bay	Horsehead	1 May 80		

List of Oyster Trays Monitored on Bayside of Eastern Shore, Virginia, 1959-1974

Tray No.	Location of Tray	Source of Oysters	Date Initiated	Date Closed	Combined with Tray
B1	Cherrystone Cr.	natives	31 Mar 59	3 Nov 61	
B2	Cherrystone Cr.	natives	31 Mar 59	1 Nov 60	B1
B3	The Gulf	Wreck Shoals	25 Feb 59	14 May 63	
B4	The Gulf	natives	25 Feb 59	18 Nov 60	B5
B5	The Gulf	natives	25 Feb 59	22 Nov 61	
B6	Hungars Cr.	natives	1 Apr 59	24 Jan 61	
B7	Occohannock Cr.	natives	26 Feb 59	5 Apr 61	
B8	Occohannock Cr.	natives	26 Feb 59	14 Nov 60	B7
B9	Chesconessex Cr.	natives	1 Apr 59	1 Aug 60	
B10	Chesconessex Cr.	natives	1 Apr 59	8 Jan 60	B9
B11	Messongo Cr.	natives	29 Mar 59	14 Nov 60	B12
B12	Messongo Cr.	natives	29 Mar 59	14 Nov 60	
B13	The Gulf	Wreck Shoals	25 Feb 60	27 Mar 62	B3
B14	Hungar's Cr.	South Carolina	2 Mar 60	16 Feb 61	
B15	Nandua Cr.	Occohannock Cr.	6 Jul 60	5 Dec 60	
B16	Cherrystone Cr.	59 strike Seaside	7 Dec 60	30 Oct 62	
B17	no record				
B18	The Gulf	Horsehead	15 Nov 60	14 May 63	S10
B19	The Gulf	natives	18 Nov 60	30 Oct 62	
B20	Cherrystone Cr.	Wreck Shoals	28 Dec 60	30 Oct 62	
B21	Occahannock Cr.	Hog Is. Bay	27 Apr 61	29 Nov 61	
B22	Cherrystone Cr.	Horsehead	27 Mar 62	3 Jul 62	
B23	The Gulf	Horsehead	27 Mar 62	4 Jan 67	to Gl.Pt.
B24	Nandua Cr.	Horsehead	27 Mar 62	29 Nov 62	lost
B25	Messongo Cr.	Horsehead	27 Mar 62	29 Nov 62	lost
B26	Cherrystone Cr.	Seaside oysters	4 Oct 62	5 May 65	moved to pier
B27	Cherrystone Cr.	Wreck Shoals	4 Oct 62	15 Sep 64	B28
B28	Cherrystone Cr.	Horsehead	9 Oct 62	15 Jul 65	
B29	The Gulf	natives	27 Dec 63	16 Nov 66	
B30	Cherrystone Cr.	Horsehead	15 May 64	10 Oct 65	B23
B31	no record				
B32	Cherrystone Cr.	natives	2 Dec 65	15 Apr 68	
B33	Cherrystone Cr.	Horsehead	3 Dec 65	15 Apr 68	
B34	Nassawadox Cr.	natives	17 Dec 65	15 Apr 68	
B35	Nassawadox Cr.	Horsehead	3 Dec 65	15 Apr 68	
B36	Cherrystone Cr.	natives	4 Jan 67	15 Apr 68	
B37	Cherrystone Cr.	natives	19 Apr 68	5 Feb 61	
B38	Cherrystone Cr.	natives	19 Apr 68	5 Feb 61	
B39	Nassawadox Cr.	Deep Water Shoals	2 May 68	16 Sep 69	
B40	Cherrystone Cr.	natives	30 Dec 68	30 Jan 71	
B41	Nassawadox Cr.	natives	23 May 69	15 Apr 70	
B42	Cherrystone Cr.	Horsehead	3 Mar 70	3 Sep 74	
B43	Cherrystone Cr.	Horsehead	12 Nov 70	11 Nov 72	B42
B44	Cherrystone Cr.	Swash Bay	6 Mar 72	3 Sep 74	
B45	Cherrystone Cr.	Curtis Cr.	30 Nov 72	4 Sep 74	

History of Lab-Bred Progeny Groups of Selected Oysters
(Monitored in Trays Mostly At VIMS Pier, off VIMS, or Tillages Ground)

Progeny Lot No.	Parentage	Location for monitoring*	Date closed tray	MSX Status
		1964		
P1	Long Island	VIMS Pier	1967	S
P2	Egg Island	"	2 Aug 67	R
P3	Mobjack Bay	"	19 Oct 67	R
P4	Potomac	"	13 Jan 67	S
P5	Long Island	"	13 Jun 67	S
P6	Horseheads James River	off VIMS 65-69; (1/2 to Eastern Shore 69)	25 Jun 76	S
P7	Mobjack	VIMS	2 Apr 70	R
P8	Mobjack	VIMS	25 Oct 67	R
P9	Mobjack	VIMS	25 Oct 67	R
P10	Mobjack	VIMS, (Eastern Shore Jul 69)	25 Jun 76	R
P11	Delaware Bay	off VIMS	13 Jun 67	R
P12	Planters Gr. N.J.	off VIMS	17 Jan 69	R
P13	Mobjack	Horsehead, James River	15 Mar 67 lost	R
P13A	Mobjack	upper James River VIMS 66-68	19 Jun 68	R
		1965		
P14	Horsehead James River	off VIMS	25 Jun 68	S
P15	Horsehead	VIMS	13 Jun 67	S
P16	Mobjack	off VIMS	25 Jul 68	R
P17	Mobjack	James River (Darlings)	19 Aug 68	R
P18	Hampton Bar	off VIMS	30 Aug 68	R
P19	Hampton Bar	James River 66-67, off VIMS 67-68	6 Jan 69	R
P20	Horseheads	off VIMS	25 Aug 69	S
P21	Horsehead	James River 66-67, off VIMS 67-	25 Jun 76	S
P22	P7	off VIMS	25 Jun 76	R
P24	Mobjack	VIMS	2 Aug 67	R
P25	Mobjack	VIMS	29 Jun 67	R
P26	South Carolina	VIMS	19 May 67	S

Progeny Lot No.	Parentage	Location for monitoring*	Date closed tray	MSX Status
		1965 cont.		
P27	Deep Rock set in 66	off VIMS	18 Sep 69	S
P28	Horsehead set in 65	off VIMS	2 Aug 67	S
		1966		
P29	Mobjack	James River	6 Mar 70	R
P29A	Mobjack	James River 66-68 off VIMS 68-	16 Sep 69	R
P29B	Mobjack	James River 66-69 Apr. off VIMS 69-	16 Sep 69	R
P30	Horsehead	Tillages	9 Sep 69 stolen	S
P31	Egg Island	Tillages	18 Apr. 75	R
P32	Mobjack	Tillages	25 Jun 76	R
P33	Horsehead	off VIMS	3 Oct 68	S
P33x	Horsehead	off VIMS 67-Feb 68 James River Feb-Oct 68	Aug 69	S
P34	VIMS Natives	Tillages	18 Jun 72	R
P35	Mobjack	Tillages	Sep 69	R
*(1/2 of this culture called P29)				
		1967		
P36	Egg Island	James River	17 Dec 69	R
P36A	Egg Island	James River 67-May 68 off VIMS	June 69 lost	R
P37	Egg Island	Tillages	13 Jan 76	R
P37A	Egg Island	off VIMS	6 Mar 70	R
P38	Burtons Bay	Tillage	17 Nov 69	S
P39	VIMS Pier Stock	VIMS	3 Oct 68	R
P40	P10	Tillages	3 Oct 68	R
P41	Mobjack	James River	17 Dec 69	R
P42	Potomac	VIMS	8 May 68	S
P43	Horsehead	VIMS	23 May 68	S
P44	Potomac	Tillages	4 Oct 71	S
P45	P-10	James River	23 Sep 69	R
P46	Potomac	James River 68-69 Tillages 69-71	17 May 71	S
P47	VIMS Natives	Tillages	18 Sep 69	R

Progeny Lot No.	Parentage	Location for monitoring*	Date closed tray	MSX Status
		1967 cont.		
P48	Potomac	VIMS	16 Oct 68	S
P49	P10	Tillages	19 Sep 69	R
P50	VIMS Natives	Tillages	27 Oct 69	R
P51	P10	Tillages	25 Jun 76	R
P52	P10	Tillages	25 Sep 76 lost	R
		1968		
P53	Long Island	Tillages	7 Oct 69	S
P54	Deep Water Shoals	Tillages	8 Oct 71	S
P55	P10	VIMS 68-69 (Tillages 69-)	24 May 73	R
P56	P20	VIMS	22 Sep 76	S
P57	Y51 (Potomac)	Tillages	6 Aug 70	S
P58	Hog Is. Bay, Seaside	off VIMS	6 Aug 70	S
P60	S52	Tillages	4 Oct 71	S
P61	Piankatank	Tillages	24 Nov 71	S
P62	Long Island	off VIMS	3 Sep 69	S
P63	Horsehead	Tillages	21 Jul 71	S
P64	Wildes Free Spat-Md. West River	off VIMS	14 Jun 73	S
		1969		
P65	Hampton Bar	Tillages	6 Oct 75	R
P66	Wildes Free Spat (Md. -West River)	Tillages	19 May 71	S
P67	P7	Tillages	6 Oct 75	R
P68	P7	Tillages	30 Jun 80	R
P69	RM-1 (Mobjack)	VIMS	25 Jan 76	R
		1970		
P70	Rappahannock	VIMS	16 Jan 72	S
P71	Horsehead	Tillages	14 Mar 72	S
P72	P37A	Tillages	25 Jun 76	R
P73	P32 x P40	Tillages	30 Jun 80	R
P74	P40	Tillages	14 Jul 75	R
P75	Mobjack	Tillages	14 Jul 75	R

Progeny Lot No.	Parentage	Location for monitoring*	Date closed tray	MSX Status
		1970 cont.		
P76	Md. West River Natives	Tillages	25 Jun 76	S
P77	P40 Solomons	Tillages	8 Jan 74	R
P78	Horsehead	Tillages	9 Mar 73	S
P79	Rappahannock	Tillages	8 Jan 74	S
P80	P40 at Solomons	Tillages	9 Jan 74	R
P81	Md. West River Natives	Tillages	9 Jan 74	S
P82	Horsehead	Rappahannock River Jun 71-Dec 71 (VIMS 71-73)	8 Nov 73	S
		1971		
P83	P55 x P68	VIMS Pier	17 Jan 73	R
P84	Hampton Bar	Tillages	7 Apr 77	R
P85	Mobjack x Horseheads	Tillages	13 Sep 76	R
P86	P35 x P31	Tillages	9 Dec 80	R
P87	Deep Water Shoals	Tillages	5 Aug 74	S
P88	P31 x P35	Tillages	7 Nov 77	R
P89	P56 x P52	Tillages	28 Feb 72 lost	R
P90	P37	Tillages	13 Sep 76	R
P91	P21 x P22	Tillages	16 Jul 80	?
P92	P6	Tillages	23 Sep 75	S
P93	P7 x P10	Tillages	16 Jul 80	R
P94	P40 - Md. at Solomons	VIMS Pier	17 Jul 73	R
P95	Y69 Md.	Tillages	20 Aug 74	R
P96	P31 x P35 Md.	Tillages	Feb 79 lost	R
P97	P35 x P31 Md.	Tillages	Feb 79 lost	R
P98	York River Wild Stock Set in Lab	Tillages	10 Jan 74	
P99	P31 x P37	Tillages	16 Jul 80	R
		1972		
P100	P73 x P73	Tillages	still active	R
P101	P37 x P37	Tillages	still active	R
P102	P72 x P73 & P72 x P72	Tillages	4 Nov 77	R

Progeny Lot No.	Parentage	Location for monitoring*	Date closed tray	MSX Status
		1972 cont.		
P103	Horsehead	Tillages	23 Aug 74	S
P104	P80	Tillages	4 Mar 76	R
P105	P35 x P37	Tillages	23 Aug 76	R
P106	P35 x P35	Tillages	25 Jun 76	R
P107	P37 x P35	Tillages	29 Sep 75	R
P108	P35 x P37	Tillages	18 Jul 74	R
P109	P31 x P51	Tillages	12 Feb 76	R
		1973		
P110-111	P78	Tillages	11 Dec 75	S
P112-116	P72	Tillages	11 Dec 75	R
P117-119	P67	Tillages	15 Dec 75	R
P120 discarded				
P121	P67 x P68	Tillages	15 Dec 75	R
P122	P86 x Y74	Tillages	15 Dec 75	R
P123	Y74	Tillages	15 Aug 75	R
P124-128	P100	Tillages	9 Feb 76	R
P127	P100	Tillages	15 Jul 76	R
P129-532	Y75	Tillages	11/20/74?	R
P133-137	P73	Tillages	16 Dec 75	R
P138-P140 discarded				
		1974		
P141	P86	Tillages	15 Jul 80	R
P142	P122	Tillages	30 Jul 76	R
P143	P122 x P127	Tillages	15 Jul 80	R
P144	P122 x P127	Tillages	30 Jun 76	R
P145	P122	Tillages	30 Jun 76	R
P146	P122	Tillages	30 Jun 76	R
P147	P99	Tillages	14 Jul 80	R
P148	P120	Tillages	30 Jun 80	?
P149	P55	Tillages	30 Jun 80	R
P150	P112	Tillages	30 Jun 80	R
P151	P88	Tillages	17 Jul 80	R
P152	Y79	Tillages	26 Jun 80	S
P153	Y-68 N.J. Set	Tillages	7 Nov 77	R

Progeny Lot No.	Parentage	Location for monitoring*	Date closed tray	MSX Status
		1975		
P154	P141 x P122	Tillages	16 Jul 80	R
P155	P122 x P127	Tillages	16 Jul 80	R
P156	P127 x P122	Tillages	still active	R
P157	P88 x P141	Tillages	Feb 77 lost	R
P158	P141 x P127	Tillages	Feb 77 lost	R
P159	P84 x P85	Tillages	11 Sep 80	R
P160	Y82	Tillages	7 Nov 77	S
P161	P122 x P141	Tillages	26 Jun 80	R
P162	P91 x P93	Tillages	18 Feb 76	R
P163	P73 x P67	Tillages	16 Jul 80	R
P164	P65 x P68	Tillages	16 Jul 80	R
P165	P99	Tillages	still active	R
P166	P37 x P68	Tillages	27 Jun 80	R
P167	P91 x P91	Tillages	27 Jun 80	R
P168	P86 x P99	Tillages	Winter 76 lost	R
P169	P124	Tillages	still active	R
P170	P68 x P73	Tillages	still active	R
		1976		
P171	Rappahannock	Tillages	23 Jul 80	S
P172	YWE x P151	Tillages	27 Jun 80	R
P173	P159 x P162	Tillages	still active	R
P174	P151 x P162	Tillages	to Eastern Shore 11 Apr 78 called S-113	R
P175	P162 x YWE	Tillages	still active	R
P176	XLA2 x P151	Tillages	still active	R
P177	P162 x P151	Tillages	9 Dec 80	R
P178	P141 x YNAA	Tillages	7 Apr 77	R
P179	XLAB x P99	Tillages	still active	R
P180	P100 x P149	Tillages	Winter 76 lost	R
P181	P141 x P99	Tillages	still active	R
P182	P88 x P99	Tillages	still active	R
P183	P121 x P149	Tillages	still active	R
P184	P121 x P159	Tillages	8 Apr 77	R
P185	P149 x P159	Tillages	8 Apr 77	R
P186	P159 x P100	Tillages	still active	R

Progeny Lot No.	Parentage	Location for monitoring*	Date closed tray	MSX Status
		1976 cont.		
P187	Wreck Shoals	Tillages	24 Jun 80	S
		1977		
P188	P156x	Tillages	24 Jun 80	R
P189	P141	Tillages	8 Dec 80	R
P190	P141 x P99 & P141 x YNAA	Tillages	still active	R
P191	no # assigned			
		1978 set		
P192	Rappahannock	Tillages	27 Jun 80	S
P193	P172 x P167	Tillages	still active	R
P194	P181 x P167	Tillages	still active	R
P195	P182 x P167	Tillages	still active	R
P196	P141 x P172	Tillages	still active	R
P197	P141 x P182	Tillages	still active	R
P198	P141 x P167	Tillages	still active	R
P199	Md. Broodstock (Dermo Study)	VIMS	26 Oct 78	?

*Most lots held during nursery stage at Ames Pond.

Table 1

Peak Seasonal Prevalences of *P. marinus* ("Dermo") in Native Acclimated Oysters at Key Stations in Virginia Rivers, from Public Oyster Beds (mostly Sept & October Samples), 1953 to 1980

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
	James River						
Hampton Bar (J4)	2 Oct 1953	30		16	47	37	0.97
	13 Oct 1954	25	4	32	52	12	1.68
	2 Nov	25		28	40	32	1.24
	28 Sep 1955	25		24	48	28	1.20
	1 Nov	25		28	52	20	1.36
	5 Sep 1956	25		20	16	64	0.76
	1 Oct	25		16	24	60	0.72
	31 Oct	25		8	32	60	0.56
	30 Sep 1957	25	12	8	32	48	1.16
	26 Nov 1963	25		4		96	0.12
	23 Nov 1964	25		4		96	0.12
Brown Shoal (J11, James River Bridge)							
	22 Sep 1956	25	4	4	8	84	0.40
	25 Sep 1957	25		4	20	76	0.32
	13 Oct 1959	25	4	16	24	56	0.92
	20 Sep	25	4	8	8	80	0.52
	31 Oct 1960	25		12	12	76	0.48
	28 Sep 1961	25			8	92	0.08
	14 Nov	25			8	92	0.08
	7 Sep 1962	25				100	0
	24 Sep	25		8		92	0.24
	29 Oct	25			4	96	0.04
	27 Aug 1963	25				100	0
	23 Nov 1964	25			4	96	0.04
	12 Nov 1965	25		12	24	64	0.60
	3 Oct 1966	25	8		12	80	0.52
	8 Nov	25			12	88	0.12
	28 Sep 1967	25		8	16	76	0.40
	24 Oct	25	4		28	68	0.48
	28 Aug 1968	25			4	96	0.04
	19 Oct 1976	25	8	4	16	72	0.68
	11 Oct 1977	25	4	8	16	72	0.60
	2 Oct 1980	25	4	8	20	68	0.64
	3 Nov 1980	25	12	4	4	80	0.76
	22 Sep 1956	25			4	96	0.04

Wreck Shoal (J17 off Jail Pt. Mouth Warwick River)							
26 Sep 1957	25				100	0
1 Sep 1959	25				100	0
13 Oct	25		4	4	92	0.16
31 Oct 1961	25				100	0
4 Nov 1963	25				100	0
11 Sep 1964	25				100	0
13 Sep 1966	25				100	0
23 Oct 1967	25			4	96	0.04
13 Nov 1969	25				100	0
19 Oct 1976	25	8	4	16	72	.68
11 Oct 1977	25	4			96	0.20
2 Oct 1980	25				100	0
	York River					
Mobjack Bay (off New Point Comfort)						
15 Sep 1959	25	4	4	16	76	0.48
15 Sep	25	8	4	20	68	0.72
15 Sep	25	4	4	18	74	0.48
15 Sep	25	4	4	20	72	0.52
15 Sep	25	4	16	36	44	1.04
15 Sep	25	4	16	24	56	0.92
31 Aug 1960	25	12	16	8	64	1.16
10 Oct	25	4	16	36	44	1.04
25 Oct 1962	25				100	0
1 Oct 1963	25				100	0
18 Oct 1977	25				100	0
Off Ellen Island						
28 Oct 1959	25		32	44	24	1.40
19 Aug 1964	25		4		96	0.12
6 Dec 1966	24	8	4	12	76	0.67
Tillages - Gloucester Point (York River Bridge)						
6 Oct 1953 FP	40	5	8	35	52	0.82
12 Oct 1954 FP	25	4	28	52	16	1.56
5 Nov 1954 FP	25	4	36	48	12	1.76
26 Sep 1955 FP	25	4	32	40	24	1.56
28 Oct 1955 FP	25		20	72	8	1.32
5 Sep 1956	25		24	44	32	1.16
2 Oct	25	4	24	32	40	1.24
29 Oct	25	4	4	32	60	0.64
30 Sep 1957	25	4	16	44	36	1.12
29 Oct	25	4	20	52	24	1.36
26 Sep 1958	25		12	4	84	0.40
30 Oct 1958	25		20	10	70	0.56
31 Oct	25		20	16	64	0.76
1 Sep 1959	25	8	8	24	60	0.88
23 Sep 1960	25		4	20	76	0.32
10 Oct 1962	25		13	7	80	0.47
20 Oct 1966 FP	25				100	0

Tillages - Gloucester Point (cont'd)							
20 Oct		25		8		92	0.40
19 Sep 1979		25	8	4	28	60	0.80
10 Oct 1980		25		8	16	76	0.40
Pages Rock (off Blundering Pt)							
10 Sep 1958		25		16	28	56	0.72
2 Dec 1964		25				100	0
29 Nov 1965		25			4	96	0.04
20 Nov 1966		25		4		96	0.12
28 Sep 1977		25	4	4	12	80	0.44
4 Nov 1979		25	4		8	88	0.28
York River Oyster Corp							
31 Oct 1967		25	4	8	20	68	0.64
Bell Rock (off Hockley Cr)							
6 Sep 1955		25		28	40	32	1.24
20 Nov 1967		25				100	0
Rappahannock River							
Broad Creek Bar (Mouth of River)							
5 Dec 1957		25				100	0
30 Nov 1961		25				100	0
4 Dec 1963		21				100	0
10 Nov 1963		25				100	0
10 Nov 1977		25	4			96	0.20
8 Oct 1980	PR	25		4	12	84	0.24
Hoghouse Bar (Towles Pt area)							
2 Oct 1953		50	2	2	30	66	0.46
4 Oct 1954		25	4	12	40	44	0.96
29 Oct 1954		25	4	16	52	28	1.20
23 Sep 1955		25			52	48	0.52
31 Oct 1955		25		8	48	44	0.72
30 Aug 1956		25	4	16	12	68	0.80
2 Oct		25		12	16	72	0.52
31 Oct		25		8	28	64	0.52
2 Oct 1957		25		12	24	64	0.60
2 Sep		25			4	96	0.04
24 Sep		25		4	4	92	0.16
27 Sep 1958		24		8	4	88	0.29
29 Oct		25		8	12	80	0.36
23 Sep 1959		25		4	12	84	0.24
7 Oct		25	4	12	16	68	0.72
6 Nov		25	4	16	8	72	0.76
4 Nov 1960		25		8	28	64	0.52
8 Aug 1961		25	4			96	0.20
25 Sep		22			4	96	0.04
23 Oct		25				100	0
11 Sep 1962		25			12	88	0.12

Hoghouse Bar (cont'd)								
	26 Sep		25		12	4	84	0.28
	8 Nov		25	4		8	88	0.28
	31 Oct	1963	25				100	0
	28 Oct	1964	25				100	0
	23 Nov	1965	23			9	91	0.09
	1 Nov	1966	25			4	96	0.04
	31 Oct	1967	24				100	0
	28 Oct	1976 BP	25		8	24	68	0.48
	23 Oct	1979 BP	25				100	0
	22 Sep	1977 BP	25			4	96	0.04
	23 Oct	1979 BP	25				100	0
	10 Oct	1980 BP	25			4	96	0.04
Morattico Bar (Curletts Pt.)								
	30 Aug	1955	10			60	40	0.60
	30 Nov	1956	25		8	8	84	0.32
	5 Dec	1957	25			8	92	0.08
	9 Dec	1958	25				100	0
	2 Dec	1959	25		4		96	0.12
	23 Nov	1965	24				100	0
	1 Nov	1966	25				100	0
Potomac River								
Cornfield Harbor & Jones Pt. (Mouth of River)								
	5 Nov	1964	25				100	0
	22 Sep	1965	25				100	0
	25 Sep	1967	25				100	0
	30 Oct	1969	25				100	0
	24 Aug	1970	25		4		96	0.12
	31 Aug	1977	25	4		24	72	0.44
Great Wicomico River								
Fleeton Pt.	1 Dec	1980	25			32	68	0.32
Piankatank River								
Burton's Pt.	6 Nov	1980	25		8	52	40	0.76

FP = Ferry Pier
PR = Parrot's Rock
BP = Balls Pt.

TABLE 2

Incidence of Dermocystidium in James River
(25 oysters per sample)

Location of Oysters	Date Sampled	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
Wreck Shoal[1]	27 Aug. 52				100	0
Deep Water Shoal					100	0
Wreck Shoal	30 Apr. 53				100	0
	15 Jul				100	0
	18 Aug.[1]			2	98	0.02
Brown Shoal[1,2]			2	2	96	0.08
Gun Rock[2]			4	10	86	0.22
Thomas Rock[1]				2	98	0.02
Brown Shoal	14 Aug. 55			12	88	0.12
Deep Water Shoal	6 Jul.				100	0
Gun Rock	22 Aug.				100	0
White Shoal					100	0
Brown Shoal	22 Sep. 56	4	4	8	84	0.40
	18 Oct.[3]				100	0
Wreck Shoal	22 Sep.			4	96	0.04
Brown Shoal	25 Sep. 57		4	20	76	0.32
Gun Rock			4	4	92	0.16
Wreck Shoal					100	
Brown Shoal	13 Oct. 59	4	16	24	56	0.92
Wreck Shal			4	4	92	0.16

Notes

Since James River seed area is marginal for Dermocystidium, tests should not be made until late in the warm season to indicate maximum intensity of infections. The samples for the last three years in the table are probably reliable tests but any taken before 1 Sept. are quite likely to be underestimates. Usually oysters do not begin to die until weighted incidence reaches 0.50, therefore only Brown Shoal in 1959 (possibly in 1956 also) shows evidence of death rate from this source.

[1]50 oysters
[2]Large old oysters from deep edge of channel
[3]Private bed below bridge.

TABLE 3. Recovery of gapers from trays

Year and month	Number dead	Gapers recovered	Per cent of dead recovered as gapers
1952			
July	48	34	71
August	113	67	59
September	74	71	96
October	29	26	90
November	9	6	33
December	4	4	100
1953			
January	12	5	42
February	2	0	0
March	7	1	14
April	2	0	0
May	15	5	33
June	52	36	69
July	114	85	75
August	262	242	92
September	264	254	96
October	112	106	95
November	30	27	90
December	5	4	80

TABLE 3. Continued

1954			
January	8	8	100
February	11	11	100
March	12	12	100
April	21	14	67
May	44	27	61
June	53	35	66
July	146	118	81
August	444	416	94
September	461	441	96
October	142	131	92
November	28	26	93
December	6	4	67
1955			
January	10	8	80
February	18	17	94
March	38	30	79
April	15	12	80
May	40	20	50
June	50	35	70
July	151	131	87

TABLE 3. Continued

August	248	236	95
September	148	143	97
October	134	132	98
	3382	2980	88

TABLE 4

Comparison of D. marinum infections in yearling oysters held in trays at Gloucester Point, 1954

Date	Tray Number	Place	No. Infections by intensities H	M	L	N	Percent Infected	Weighted Incidence
7 Jun	38	South Carolina				25	0	0
31 May	39	Chincoteague				25	0	0
12 Jun	40	York River				25	0	0
23 Jul	38	South Carolina			1	24	4	0.04
27 Jul	39	Chincoteague		1	3	21	16	0.24
23 Jul	40	York River			1	24	4	0.04
28 Aug	38	South Carolina			5	20	20	0.20
28 Aug	39	Chincoteague			2	22	8	0.08
28 Aug	40	York River			6	19	24	0.24
6 Sep	38	South Carolina			4	21	16	0.16
8 Sep	39	Chincoteague		1	12	12	52	0.60
24 Sep	40	York River	2		3	20	20	0.52
21 Oct	38	South Carolina			1	24	4	0.04
27 Oct	39	Chincoteague	2	4	7	10	56	1.26
29 Oct	40	York River	1	2	3	19	24	0.56
		Totals	5	8	47	311		
		Averages					15	0.24

TABLE 5

Occurrence of *D. marinum* in live oysters of the Chesapeake Bay area

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
James River Seed Area							
Brown Shoal	18 Aug 53	50		2	2	96	0.08
	14 Aug 55	25			12	88	0.12
Buoy 10	18 Aug 53	50			2	98	0.02
Buoy 8	18 Aug 53	50		4	10	86	0.22
Buoy 6	18 Aug 53	50			2	98	0.02
White Shoal	22 Aug 55	25				100	0
Gun Rock	22 Aug 55	25				100	0
Wreck Shoal	26 Aug 52	50				100	0
	15 Jul 53	45				100	0
	22 Aug 55	25			8	92	0.24
Deep Water Shoal	26 Aug 52	23				100	0
	22 Jun 54	10				100	0
	6 Jul 55	20				100	0
	7 Jul 55	25				100	0
York River and Mobjack Bay							
Ellen Island	22 Aug 52	49	20	10	22	47	1.55
Pages Rock	21 Aug 52	27	15	11	4	70	1.11
	19 Aug 55	25	8	4	8	80	0.60

Claybank	19 Aug 55	25	0	8	48	44	0.72
	29 Aug 55	25		12	16	72	0.52
Fox Creek area	19 Aug 55	25	4	28	52	16	1.56
Poropotank Creek	6 Sep 55	22			36	64	0.36
Bell Rock	19 Aug 55	25	4	8	44	44	0.88
	29 Aug 55	20			30	70	0.30
	6 Sep 55	25		28	40	32	1.24
Severn River	24 Aug 53	50		2	4	94	0.10
		Rappahannock River					
Hoghouse Bar	21 Aug 52	50	8	8	4	80	0.66
Morattico Bar	7 Aug 53	50			4	96	0.10
Lancaster Creek	21 Aug 54	16		6		94	0.19
Bowlers Rock	26 Aug 55	25				100	0.00
	26 Aug 55	25				100	0.00
		Potomac River					
Coan River	9 Sep 54	25			12	88	0.12
Yeocomico River	9 Sep 54	25			84	16	0.84
Ragged Point	9 Sep 54	25			16	84	0.16
Billy's Point	9 Sep 54	25				100	0
Nomini Bay	8 Sep 55	20				100	0
		Hampton Roads					
Ocean View	25 Aug 52	50	6	20	22	52	1.12
	22 Aug 54	25	4	24	32	40	1.24
	26 Aug 54	25		12	56	32	0.92
Nansemond Ridge	11 Aug 54	25		32	24	44	1.20

	27 Sep 55	25		16	28	56	0.76
Hazelwood Ground	21 Sep 54	17	12	29	47	12	1.94
	27 Sep 55	25		24	44	32	1.16
	Western Shore, Chesapeake Bay, Virginia						
Egg Island	19 Aug 53	25	8	28	16	48	1.40
Horn Harbor	25 Aug 52	50	14	4	22	60	1.04
Wolf Trap	19 Aug 53	24		4	4	92	0.16
Slaughter's Ground	7 Oct 54	20	10	20	55	15	1.65
Fleet Point Beacon	7 Oct 54	20		5	40	55	0.55
	Eastern Shore, Chesapeake Bay, Virginia						
Cherrystone Creek	19 Dec 53	24				100	0
	19 Dec 53	25			12	88	0.12
	1 Sep 54	25		24	32	44	1.04
	25 Sep 54	20		20	15	65	0.75
	25 Sep 54	20				100	0
The Gulf	26 Sep 55	25		32	32	36	1.28
The Gulf (old oysters)	26 Sep 55	25			16	84	0.16
Hungar's Creek	14 Oct 55	26		11	54	35	0.90
Occohannock Creek	14 Oct 55	25		6	65	29	0.82
	14 Oct 55	25	4	12	44	40	1.00
Nandua Creek	14 Oct 55	25		24	28	48	1.00
Pungoteague Creek	1 Sep 54	25	4	8	68	20	1.12
	14 Oct 55	25		12	56	32	0.92
Chesconessex	14 Oct 55	25	4	4	17	75	0.63
Messongo Creek	1 Sep 54	25	4		76	20	1.16

	26 Sep 55	25		32	56	12	1.52
Pocomoke Sound							
Middle Ground	1 Sep 54	17	4	12	12	76	0.47
Buoy Rock	1 Sep 54	20		5	15	80	0.24
Dogfish Rock	26 Sep 55	24		21	37	42	1.00
	Chesapeake Bay, Maryland						
Tangier Sound							
Great Rock	8 Nov 54	19				100	0
Little Egg Island	8 Nov 54	20		25	35	40	1.10
Sharkfin Shoal	4 Nov 54	20				100	0
Holland Straits	14 Oct 54	25			4	96	0.04
Cedar Point Hollow	25 Oct 54	20		20	45	35	1.04
Solomons Island	7 Oct 54	25		40	44	16	1.64
Punch Island Creek	25 Oct 54	20				100	0
Poplar Island	28 Oct 54	20				100	0
Parker's Ground	27 Oct 54	20				100	0
	Seaside of Virginia and Maryland						
Hogg Island Bay	1 Sep 54	25				100	0
	14 Oct 55	25				100	0
Willis Wharf	30 Jul 53	22				100	0
Metomkin Bay	21 Sep 54	25				100	0
Watts Bay	26 Sep 55	25				100	0
Assateague Cove	31 Aug 54	26			4	96	0.04
Chincoteague Bay	30 Jul 53	35				100	0
	25 Nov 53	25			16	84	0.16

9 Sep 54	25		100	0
9 Nov 54	20		100	0
28 Sep 55	21		100	0
13 Oct 55	25	4	96	0.13

TABLE 6

Summary of Dermocystidium marinum infections in oysters from the mortality areas, August-September 1955.

Location	Number tested	Number of infections				Per cent infected	Weighted incidence*
		Heavy	Moderate	Light	Negative		
Rappahannock River							
Hoghouse to Morattico							
Live oysters	50	1	4	16	29	42	0.66
Gapers	113	6	11	45	51	55	0.99
Above Morattico							
Live oysters	54				54	0	0.00
Gapers	27			1	26	4	0.04
York River							
Gloucester Point to Bell Rock							
Live oysters	192	4	22	66	100	48	0.79
Gapers	33	1	3	9	20	39	1.00
Trays at Gloucester Point							
Tray 11							
Live oysters-10 Sep	25	1	9	14	1	96	1.84
Gapers for August	13	12			1	92	4.62
All trays-August 1955							
Gapers	236	213	11	6	6	97	4.68

* A value combining incidence and intensity of infections. The intensity categories of negative, light, moderate, and heavy were assigned, respectively, the arbitrary values of 0, 1, 3, and 5. The weighted incidence is obtained by adding all of the intensity values for a group of oysters and dividing by the total numbers tested. A weighted incidence of 1.0 indicates that the average infection in the group was light, etc.

TABLE 7

Culture tests of live oysters for Dermocystidium marinum, August and September 1955
Virginia Fisheries Laboratory, Gloucester Point

Date	Location	Tested	Number of oysters				Per cent infected	Weighted incidence
			Heavy	Moderate	Light	Negative		
			Rappahannock River					
29 Aug	Smokey Point	10		1	3	6	40	0.60
25 "	Pollard's ground (off Deep Creek)	10			2	8	20	0.20
25 "	Pollard's ground (Piney Is.)	10			4	6	40	0.40
30 "	Piney Island (offshore)	10	1	3	1	5	50	1.50
29 "	Morattico Bar (offshore corner)	10			6	4	60	0.60
29 "	Layton's Ridge	4				4	0	0.00
26 "	Bowler's Rock	25				25	0	0.00
26 "	Garrett's ground (above Bowlers)	25				25	0	0.00
			York River					
19 Aug	Pages Rock	25	2	1	2	20	20	0.60
19 "	Fred Leigh's ground (across from Claybank)	25		2	12	11	56	0.72
19 "	Williams' ground (off Fox Creek)	25	1	7	13	4	84	1.56
	Blake's ground (off Claybank)	25		3	4	18	28	0.52
6 Sep	Poropotank Creek	22			8	14	36	0.36
19 Aug	Bell Rock	25	1	2	11	11	56	0.88
29 "	Bell Rock	20			6	14	30	0.30
6 Sep	Bell Rock	25		7	10	8	68	1.24
			Nomini Bay					
4 Sep	Murphy's ground	20				20	0	0.00
			Machodoc River					
1 Sep	Tidwell area	13				13	0	0.00
	" "	12				12	0	0.00

TABLE 8

Culture tests of gapers for Dermocystidium marinum, August and September 1955
Virginia Fisheries Laboratory, Gloucester Point

Date	Location	Tested	Number of oysters				Per cent infected	Weighted incidence
			Heavy	Moderate	Light	Negative		
			Rappahannock River					
	Drummond ground	1	1				100	5.00
30 Aug	Hoghouse Rock	2			2		100	1.00
30 "	Ferguson's ground (Hoghouse)	1				1	0	0.00
30 "	Ferguson's ground (Urbanna Creek area)	8	1		7		100	1.50
30 "	Ferguson's ground (Urbanna Creek area)	2		1		1	50	1.50
30 "	Goose Point	27		5	10	12	55	0.96
29 "	Smoky Point	2	1			1	50	2.50
6 Sep	Smoky Point	8				8	0	0.00
29 Aug	Bluff Rock (inshore)	8	1	1	3	3	62	1.38
29 "	Piney Island (inshore)	15	2		9	4	73	0.74
25 "	Pollard's ground (Piney Is.)	10	1	1	6	2	80	1.40
25 "	Pollard's ground (off Deep Creek)	9	1		8		100	1.40
29 "	Morattico Bar	15		2	3	10	33	0.60
29 "	Lord Mott ground (Morattico)	15		1	5	9	40	0.53
29 "	Layton's Ridge	18			1	17	6	0.06
3 Sep	Jones Point	8				8	0	0.00
29 Aug	Ross Rock	1				1	0	0.00
			York River					
29 Aug	Blake's ground (Claybank)	25	1	3	9	12	52	0.92
31 "	Travis ground (Bell Rock)	8				8	0	0.00
			Nomini Bay					
4 Sep	Murphy's ground	20				20	0	
	" "	10			1	9	10	0.10

Table 9. History of five series of live oysters tested for *D. marinum* activity over several years at VIMS Pier (Trays 17-20 and 21-24) and by sampling native oysters monthly.

Designation	Source	Moved to	Type of habitat	Remarks
Trays 17-20	Wreck Shoal James River	Gloucester Point	Trays	Moved from nonendemic area
Trays 21-24	Hoghouse Bar, Rappahannock River	Gloucester Point	Trays	Moved from endemic area
Hoghouse Bar natives	Hoghouse Bar, Rappahannock River		Public grounds	Dredged or tonged
Hampton Bar transplants	Hampton Bar, Hampton Roads		Planted grounds	Tonged
Gloucester Point natives	Gloucester Point, York River		Pier pilings	Hand picked

TABLE 10

Monthly tests for Dermocystidium marinum in live oysters

Hoghouse Bar Natives, dredged from an endemic area

Date	Number tested	Per cent infections				Per cent infected	Weighted incidence
		Heavy	Moderate	Light	Negative		
1953							
7 May	26	0	0	0	100	0	0.00
16 Jun	20	0	0	5	95	5	0.05
7 Jul	52	2	4	4	92	8	0.25
4 Aug	50	2	2	12	84	16	0.28
31 Aug	50	2	2	20	76	24	0.36
2 Oct	50	2	2	30	66	34	0.46
2 Nov	50	0	12	32	56	44	0.68
2 Dec	50	0	2	44	54	46	0.50
1954							
7 Jan	25	0	0	12	88	12	0.12
2 Feb	25	0	0	0	100	0	0.00
8 Mar	60	0	2	5	93	7	0.10
1 Apr	40	0	0	2	98	2	0.03
12 May	40	0	0	0	100	0	0.00
1 Jun	40	0	0	8	93	7	0.08
2 Jul	40	0	8	5	88	13	0.28
28 Jul	40	0	10	12	78	22	0.43
30 Aug	40	0	10	32	58	42	0.63
4 Oct	25	4	12	40	44	56	1.20
29 Oct	25	4	16	52	28	72	1.20
1955							
17 Jan	25	0	0	8	92	8	0.08
1 Mar	25	0	0	0	100	0	0.00
29 Mar	25			4	96	4	0.04
28 Apr	25				100	0	0.00
1 Jun	25				100	0	0.00
30 Jun	25		8	4	88	12	0.24
27 Jul	25			12	88	12	0.12
26 Aug	25	8	20	52	20	80	1.52
Hampton Bar Transplants, tonged from an endemic area							
1953							
20 Jan	51	0	0	10	90	10	0.10
15 Jul	25	4	16	8	72	28	0.76
23 Jul	25	4	20	12	64	36	0.92
10 Aug	45	0	7	38	56	44	0.58
27 Aug	50	0	12	36	52	48	0.72
2 Oct	30	0	17	47	37	63	0.97
2 Nov	40	5	5	62	28	72	1.03
2 Dec	40	2	2	40	55	45	0.60

TABLE 10
(continued)

Date	Number tested	Per cent infections				Per cent infected	Weighted incidence
		Heavy	Moderate	Light	Negative		
1954							
6 Jan	40	0	2	32	65	35	0.40
9 Feb	40	0	2	15	82	18	0.23
8 Mar	40	0	0	2	98	2	0.03
3 Apr	40	0	0	0	100	0	0.00
11 May	40	0	0	0	100	0	0.00
3 Jun	40	0	0	28	72	28	0.28
1 Jul	40	2	5	20	72	28	0.48
29 Jul	40	8	10	8	75	25	0.75
27 Aug	40	12	22	20	45	55	1.50
13 Oct	25	4	32	52	12	88	1.68
2 Nov	25	0	28	40	32	68	1.24
10 Dec	25	0	0	36	64	36	0.36
1955							
10 Feb	25	0	0	24	76	24	0.24
9 Mar	25	0	0	8	92	8	0.08
2 Apr	25				100	0	0.00
27 Apr	25			4	96	4	0.04
31 May	25			4	96	4	0.04
1 Jul	25	8	4	12	76	24	0.68
26 Jul	25	8	12	28	52	48	0.84
1 Sep	25	0	0	24	76	24	0.24
Gloucester Point Natives, collected from Ferry Pier pilings in an endemic area							
1953							
17 Aug	50	2	20	30	48	52	1.00
27 Aug	50	0	20	54	26	74	1.14
6 Oct	40	5	8	35	52	48	0.83
29 Oct	25	0	20	36	44	56	0.96
1 Dec	25	0	20	36	44	56	0.96
18 Dec	25	0	8	52	40	60	0.76
1954							
7 Jan	25	0	0	12	88	12	0.12
1 Feb	25	0	0	20	80	20	0.20
4 Mar	25	0	8	16	76	24	0.40
7 Apr	30	0	0	0	100	0	0.00
6 May	25	0	4	16	80	20	0.28
3 Jun	25	0	16	16	68	32	0.64
29 Jun	25	4	4	16	76	24	0.48
29 Jul	25	0	36	28	36	64	1.36
26 Aug	25	12	36	32	20	80	2.00
12 Oct	25	4	28	52	16	84	1.56

TABLE 10
(continued)

Date	Number tested	Per cent infections				Per cent infected	Weighted incidence
		Heavy	Moderate	Light	Negative		
1954							
5 Nov	25	4	36	48	12	88	1.76
30 Nov	25	0	8	56	36	64	0.80
1955							
14 Jan	25	0	4	36	60	40	0.48
3 Feb	25	0	4	16	80	20	0.28
2 Mar	25	0	0	8	92	8	0.08
1 Apr	25				100	0	0.00
28 Apr	25		4		96	4	0.12
2 Jun	25			24	76	24	0.24
29 Jun	25		20	32	48	52	0.92
26 Jul	25		32	32	36	64	1.28
29 Aug	25	4	24	44	28	72	1.36

Table 11

Annual Mortalities from *D. marinum* and Prevalences of the Pathogen in Gapers from Trays at VIMS Pier

Year	Trays	Death Rate (percent)	No. Dead	No. Gapers Tested	Percent Serious Infection (heavy & mod)
1952	1-3	24.8	56	33	94
1953	6-10	34.7	275	251	87
1954	6-9,11-12,16 17-20	55.5	675	625	92
1955	11-12,25-26,33,37, 41	37.3	455	383	87
1956	25,26,33,37,40,41	23.9	191	143	71
1957	40,68,69	43.2	103	49	88
1958	74-76	29.0	155	96	78
1959	74-76,97	59.0	241	129	84

Table 12

Mortalities of Tray Oysters and Prevalences of *Dermocystidium marinum* in Gapers at VIMS Pier, 1952 to 1959

Year	Month	Death Rate Per Thousand	No. Dead	No. Gapers Tested	Percent Serious Infections
			Trays 1-3, 1952		
1952	Apr	9	2	0	-
	May	18	4	1	100
	Jun	18	4	1	100
	Jul	57	12	6	100
	Aug	112	22	14	86
	Sep	28	5	5	100
	Oct	29	5	5	100
	Nov	6	1	0	-
	Dec	6	1	1	100
			Trays 6-10, 1953		
1953	Jan	6	5	5	40
	Feb	0	0	0	-
	Mar	3	2	1	0
	Apr	1	1	0	-
	May	8	6	4	0
	Jun	23	18	14	43
	Jul	65	49	43	88
	Aug	122	85	85	96
	Sep	118	74	66	89
	Oct	49	27	26	96
	Nov	11	6	5	100
	Dec	4	2	2	50
			Trays 6-9, 11-12, 16, 17-20, 1954		
1954	Jan	1	2	2	0
	Feb	5	7	7	14
	Mar	5	7	7	14
	Apr	7	10	6	0
	May	16	22	11	18
	Jun	24	30	21	55
	Jul	72	86	77	94
	Aug	234	264	258	96
	Sep	271	201	193	100
	Oct	80	41	39	95
	Nov	7	3	3	100
	Dec	6	2	1	100

Table 12 (cont'd)

Year	Month	Death Rate Per Thousand	No. Dead	No. Gapers Tested	Percent Serious Infections
		Trays 11-12, 25-26, 33, 37, 41, 1955			
1955	Jan	3	4	4	25
	Feb	3	4	2	0
	Mar	8	10	9	0
	Apr	5	6	3	0
	May	13	16	5	20
	Jun	14	17	10	20
	Jul	79	93	82	88
	Aug	149	161	141	97
	Sep	73	67	60	95
	Oct	74	61	55	96
	Nov	14	11	9	100
	Dec	7	5	3	100
		Trays 25, 26, 33, 37, 40, 41, 1956			
1956	Jan	6	5	4	25
	Feb	3	2	2	50
	Mar	10	8	6	0
	Apr	5	4	2	0
	May	20	15	10	10
	Jun	25	19	12	8
	Jul	33	24	14	93
	Aug	58	40	29	79
	Sep	84	55	49	98
	Oct	28	15	11	100
	Nov	6	3	3	100
	Dec	2	1	1	100
		Trays 40, 68, 69, 1957			
	Jan	3	1	1	100
	Feb	6	2	0	-
	Mar	3	1	0	-
	Apr	3	1	0	-
	May	12	4	4	0
	Jun	47	13	12	66
	Jul	98	26	7	100
	Aug	117	28	13	100
	Sep	106	17	6	100
	Oct	56	8	6	84
	Nov	14	1	0	-
	Dec	21	1	0	-

Table 12 (concl'd)

Year	Month	Death Rate Per Thousand	No. Dead	No. Gapers Tested	Percent Serious Infections
			Trays 74-76, 1958		
1958	Jan	4	2	1	0
	Feb	8	4	4	0
	Mar	6	3	0	-
	Apr	6	3	0	-
	May	10	5	0	-
	Jun	6	3	3	0
	Jul	30	15	6	33
	Aug	123	60	49	88
	Sep	104	43	30	93
	Oct	33	12	5	100
	Nov	0	0	0	-
	Dec	18	5	1	0
			Trays 74-76, 97, 1959		
1959	Jan	7	3	2	0
	Feb	2	1	0	-
	Mar	9	4	1	0
	Apr	0	0	0	-
	May	14	6	0	-
	Jun	9	4	2	0
	Jul	110	46	22	64
	Aug	170	63	42	86
	Sep	262	77	34	100
	Oct	162	33	24	94
	Nov	27	4	2	100
	Dec				

TABLE 13

Effects of artificially-infected oysters on mortalities and prevalences of *D. marinum* in disease-free oysters when mixed in close proximity early in the warm season, 1957

	No. Tested	Percentages by Intensities				Weighted Incidence	Mortality % (8 Jul - 4 Nov)
		H	M	L	N		
Tray 92							
9 Nov Group 1	25		4	16	80	0.28	5.6
9 Nov Group 2	25		4	20	76	0.32	
Tray 93							
4 Nov Group 1	25	4	12	52	32	1.08	26.9
4 Nov Group 2	25	8	12	64	16	1.40	
Yellow-painted, infected lot							
4 Nov Group 2	14		64	36	0	2.29	32.7
8 Nov Group 1	19		37	63	0	1.74	

Description of Experiment

Two legged trays, with a solid-board divider in the middle of each, were stocked with Deep Water Shoal, James River oysters. The trays were set 50 ft. apart well away from VIMS Pier on sandy bottom with no wild oysters nearby. On 8 July 1957, 49 oysters with yellow paint marks were added to Tray 93 after being artificially infected with Dermo by feeding minced infected gapers in an aquarium (See 1965 Dermo paper). Each end of the trays was treated as a separate group for Dermo tests although death rates apply to whole tray lots.

TABLE 14

Causes of Deaths in Gapers from Susceptible
James River Oysters in York River, 1979
(Oysters selected one or more year by MSX--acclimated)

Tray No.	Date imported	No. Gapers	Causes of Deaths		
			MSX	Dermo	Others
Y88	4 Mar 76	5	1	4	
Y90	1 Sep 76	5	0	2	
Y95	17 Aug 77	25	7	10	1 Bucephalus
Y96	11 Oct 77	10	5	0	1 L hemocytes
Y97	24 Mar 78	11	9	0	1 Bucephalus
Y98	13 Mar 78	16	12	2	1 Bucephalus
Y99	13 Mar 78	17	7	1	3 Bucephalus
Y100	13 Mar 78	7	6	0	0 Bucephalus
Y101	28 Aug 78	28	12	0	0 Bucephalus
Totals for year		124	59	19	7

59/124 = 47.6% infected with MSX.

19/124 = 15.2% infected with Dermo.

7/124 = 6.0% infested with Bucephalus

A disproportionate number of a year's gapers are recovered in cold weather when scavenger activity is absent and decay is slow. This may decrease MSX, and increase Dermo prevalence if the pathogen is present. It probably was not in several trays, specially Y100 and Y101. Gapers for a full year.

Table 15

Incidence of D. marinum in Gapers at VIMS Pier by Months, 1952-1954

Trays 1-3, 6-10, 14, 22-24*

Year	Month	Number Tested	Number Infected	Percentage Infected
1952				
	July	16	12	75.0
	August	49	47	95.9
	September	51	48	94.1
	October	20	19	95.0
	November	4	3	75.0
	December	2	2	100.0
1953				
	January	7	4	57.1
	February	1	1	100.1
	March	2	0	0
	April	0	-	-
	May	5	1	20.0
	June	23	11	47.8
	July	63	59	93.6
	August	142	134	94.4
	September	118	116	98.3
	October	45	45	100.0
	November	12	10	83.3
	December	2	2	100.0
1954				
	January	4	3	75.0
	February	1	0	0
	March	2	0	-
	April	7	3	42.8
	May	9	5	55.6
	June	16	13	81.2
	July	56	55	98.2
	August	155	153	98.7
	September	134	134	100.0
	October	25	25	100.0
	November	5	5	100.0
	December	1	1	100.0

* Data on trays 14 and 22-24 included beginning 1 June 1953.

Footnote: Tray 24 closed 1 October 1953; Tray 23 closed 1 February 1954; Tray 22 closed 1 June 1954.

Incidence of D. marinum in Gapers at VIMS Pier
by Months, 1952-1954

From oysters 1 and 2 years old, transplanted when few months old
Trays 11-12 (1951 set James R. and 1951 set Corrotoman R.)
Imported 10 July 1952 and 19 June 1952

Year	Month	Number Tested	Number Infected	Percentage Infected
1952 (yearlings)	June	0	-	-
	July	0	-	-
	August	0	-	-
	September	1	1	100.0
	October	0	-	-
	November	0	-	-
	December	2	0	0
1953 (2 yr.olds)	January	0	-	-
	February	1	0	0
	March	5	0	0
	April	2	0	0
	May	0	-	-
	June	3	0	0
	July	9	6	66.6
	August	39	36	92.3
	September	45	44	97.7
	October	16	16	100.0
	November	4	4	100.0
	December	0	-	-
1954 (3 yr.olds)	January	1	0	0
	February	0	-	-
	March	3	1	33.3
	April	3	0	0
	May	3	2	66.6
	June	6	5	83.3
	July	33	30	90.9
	August	79	79	100.0
	September	74	74	100.0
	October	17	17	100.0
	November	0	-	-
	December	0	-	-

Incidence of *D. marinum* in Gapers at VIMS Pier by Months, 1952-1954

(Disease-free oysters transplanted from non-endemic area)

Tray 14 only 1952-53
(Ross Rock Rapp. R. oysters imported 30 June 1952)

Year	Month	Number Tested	Number Infected	Percentage Infected
1952				
	July	0	-	-
	August	0	-	-
	September	1	1	100.0
	October	1	1	100.0
	November	0	-	-
	December	0	-	-
1953				
	January	0	-	-
	February	0	-	-
	March	1	0	0
	April	0	-	-
	May	0	-	-
	June	4	2	50.0
	July	2	2	100.0
	August	13	11	84.6
	September	10	10	100.0
	October	2	2	100.0
	November	0	-	-
	December	0	-	-
1954				
	January	0	-	-
	February	1	0	0
	March	1	0	0
	April	3	1	33.3
	May	3	1	33.3
	June	2	2	100.0
	July	16	16	100.0
	August	24	24	100.0
	September	19	19	100.0
	October	2	2	100.0
	November	1	1	100.0

Trays 17-20 1953-1954
(Wreck Shoal oysters imported 30 April 1953)

Year	Month	Number Tested	Number Infected	Percentage Infected
1953				
	May	0	-	-
	June	2	0	0
	July	3	0	0
	August	23	19	82.6
	September	35	29	82.2
	October	18	16	88.8
	November	5	4	80.0
	December	1	0	0
1954				
	January	1	0	0
	February	7	2	28.6
	March	3	2	66.6
	April	1	0	0
	May	3	1	33.3
	June	4	4	100.0
	July	13	13	100.0
	August	56	56	100.0
	September	39	39	100.0
	October	6	6	100.0
	November	2	2	100.0

Method of Overwintering of Dermo (*P. marinus*) in Oysters

J. D. Andrews, VIMS

9 January 1981

Andrews and Hewatt (1957) stated that most *P. marinus* infections were gradually eliminated in winter and spring with the implication that the pathogen could not withstand low temperatures. Yet a few infections were shown to have persisted through the winter and spring to initiate new epizootic mortalities in summer. If some pathogen cells can survive the winter physically, why do not infections persist in all oysters? Groups of oysters showing nearly 100% prevalences of *P. marinus* about 1 November were found to have few or no infections in March to May (Andrews and Hewatt, 1957, Table 2). It was presumed that winter stages of *P. marinus* were not responding to the thioglycollate test, or that "hidden" or localized infections were not being found. Ray (1954) tested all tissues of infected spat to eliminate the possibility that localized infections persisted through the winter.

Thirty years of experience with *P. marinus* suggest that an active role of expulsion by oysters rather than a physical one explains the seasonal declines in prevalence found by Andrews and Hewatt (1957) and Andrews (1965). The pathogen requires high temperatures to multiply in oysters; it kills readily above 25°C but barely holds its intensity levels at 20°C. *P. marinus* is readily phagocytized by oyster hemocytes, but it overwhelms oysters by rapid multiplication at summer

temperatures in Virginia- >25°C mid-June to late September. This requirement for high summer temperatures to multiply and kill oysters explains the failure of P. marinus to persist north of Delaware Bay. When temperatures drop below 20°C (mid-October usually), the ecological advantage shifts to oysters and the pathogen is expelled (Andrews, 1967).

Oyster populations with infection levels as high as 88% of P. marinus on 8 October 1965 exhibited only 8% infection on 31 December (Andrews, 1965). Furthermore, these lots of oysters fattened satisfactorily for market by December. Only 11 of 175 live oysters tested entered the winter with P. marinus infections. Presumably the most serious infections were the last to regress for a disproportionate number of advanced infections (heavy and moderate) occurred in winter as gapers (Table 1) or in live oysters tested by the thioglycollate method. Unfortunately, light and some moderate intensity infections cannot be diagnosed in stained sections of oyster tissues. Thousands of preserved oysters from winter collections at VIMS are not useful in studying overwintering of P. marinus.

It now appears that P. marinus is not eliminated either by low temperatures or low salinities per se, but rather by active expulsion by oysters. This precludes removal by oysters during the three-month cold period (5°C) from mid-December to 1 April in Virginia when dormancy is acquired. The time of reduction and removal of P. marinus infections from live oysters is mid-October to late December when temperatures are cool and oysters quite active. A few oysters with

advanced infections die in December and January when death rates are very low and gapers few (Andrews and Hewatt, 1957, Table 3). Probably overwintering infections reflect the number of advanced infections when the physiological balance is shifted by decreasing temperatures from favoring the pathogen to one enhancing oyster defenses or put another way, when the pathogen ceases to multiply rapidly in the host. Probably oysters are removing some pathogen cells continuously.

Experiments to estimate the number of infections of P. marinus surviving the cold winter-spring season have shown low percentages in the range of 10% or less. One approach was to estimate the number of surviving overwinter infections from the number of gapers that died from P. marinus before 1 August each year. Disease-free oysters moved in spring to VIMS Pier where trays of diseased oysters were being monitored usually exhibited their first Dermo-killed gapers in late August. In 1954, 690 market-size oysters with overwintering infections from Hoghouse Bar in the Rappahannock River yielded 13 infected gapers (all advanced infections) before 1 August 1954. This date is intended to preclude inclusion of second generation infections which require about 30 days to mature and kill oysters. The 2.2% deaths from Dermo in June and July in three trays of these Hoghouse oysters are typical of the low level of overwintering infective sources available in populations with 80 to 90% infection the previous summer.

A second method of estimating overwintering infections is to sequester oysters in heated, standing-water aquaria in April and May.

Within 20 to 30 days infections develop to advanced stages and the first gaper occurs. At this time it is necessary to kill the survivors to avoid 2nd generation infections. It is also important to have sampled the population the previous October to establish the level of infection before overwintering began. In 1956 two lots of native York River oysters from Tillage grounds were held in 26° to 32°C waters from 19 April to 15 May. The two lots each of 25 oysters, yielded 3 and 4 Dermo cases with 1 heavy, 2 moderate and 4 light infections. These prevalences of 12 and 16% are higher than usually expected but the 3 cases diagnosed as very light may never have achieved pathogenic status which would leave 4% and 12% prevalence of infective gapers eventually.

In 1954, four lots (15-17 each) of acclimated oysters (exposed to Dermo the previous summer) were held in heated aquaria beginning from 9 February or 3 April 1954 for about 90 days (Andrews, 1957). The first gapers with Dermo appeared in 25 to 30 days. The control lot had no infections after 75 days. There appeared to be 0, 1, 2, and 3 Dermo infections, respectively, in gapers that were original overwintering ones vs 2nd generation infections acquired in the aquaria. Bunches of gapers occurred at about 60 and 90 days of incubation which were presumed to represent 2nd and 3rd generation infections.

On 21 February 1962, two acclimated lots of 25 oysters each (Y2 York River) were placed in heated aquaria. The first gaper with a moderate Dermo infection occurred in 16 days and the second with a

heavy case in 30 days. Subsequent infections were nearly a month later. In the second tray 1 box occurred on the 18th day and 4 gapers with heavy infections on the 30th day. Five more gapers with heavy infections occurred in the next 5 days. This tray-lot of oysters had 60% infection on 18 October 1961 of which two-thirds were advanced (moderate and heavy) cases. This year's overwintering experiment demonstrates the variability that can occur when small numbers of oysters are tested. When there are several hundred oysters in a tray, or thousands on a bed, a low percentage of overwintering infections can provide adequate sources of first generation infective material. As pointed out earlier, oysters with advanced infections appear to retain pathogens into the winter more frequently than those with light infections.

The low death rates from Dermo in winter and spring (pre-MSX years of the 1950's) and the few infections, but rather high proportion of advanced infectons in those seasons (particularly in gapers, Table 1) contribute to the speculation that Dermo is absent or hidden in winter and spring. Live-oyster samples from March through May, after the worst Dermo infections have killed their hosts in early winter, often show no infections (Andrews and Hewatt, 1957). This is a reflection of low prevalences and inadequate numbers of oysters in samples to demonstrate the true level of infection. In the 1950's, samples were often enlarged to 40 or 50 oysters in recognition of this problem. There is no evidence that P. marinus has an unrecognized resting stage in oysters or that it sequesters itself in tissues other than mantle, gill and anal tube that are commonly tested in

thioglycollate medium. The wide variety of bivalve mollusks that exhibit Dermo-like pathogens were once suspected of being reservoir hosts, but interspecies infection experiments have all failed (Andrews and Hewatt, 1957; Valiulis and Mackin, 1969; Andrews, 1976; Perkins, 1980 pers. comm). Some of these bivalve hosts retained Dermo-like stages throughout the winter and spring in 100% of the individuals of a population , but always at light intensity levels in the 1950's when P. marinus was much more abundant than it was in the 1960's and 1970's.

(See Andrews and Hewatt, 1957; Andrews, 1965, 1967 for previous discussions of overwintering--some statements are now considered to be erroneous in analysis--same data now restudied, JDA.)

Prevalences* of P. marinum in Winter Gapers, VIMS Pier 1952-54

Tabulated from Andrews and Hewatt, 1957, Table 3

Year	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total Prevalences	Total Gapers
					Trays 1-3, 6-10					
1952-53	1-2-0-1	1-1-0-0	1-2-1-3	0-0-1-0	0-0-0-1	0	1-0-0-4	5-3-1-8	9-8-3-17	37
1953-54	6-1-0-0	0-1-1-0	0-2-1-1	0	0-0-0-1	0-1-1-2	2-1-1-2	7-2-2-4	15-8-6-10	39
1954-55	3-1-0-0	1-0-0-0	0-0-1-1	0-1-0-4	0	0-0-1-0	0-0-2-4	1-0-0-6	5-2-4-15	26
					Trays 11-12					
1953-54	4-0-0-0	0	0-0-0-1	0	0-0-1-2	0-0-0-3	0-0-2-1	2-2-1-1	6-2-4-8	20
1954-55	0	0	0	0	0-0-1-0	0	0	0-0-2-0	0-0-3-0	3
					Trays 17-20					
1953-54	3-0-1-1	0-0-0-1	0-0-0-1	1-0-1-5	0-1-1-1	0-0-0-1	0-0-1-2	1-1-2-0	5-2-6-12	25
					Trays 21-24					
1953-54	4-0-0-2	0	0	0	0	0	0	1-0-0-0	5-0-0-2	7
Prevalences	21-4-1-4	2-2-1-1	1-4-3-7	1-1-2-9	0-1-3-5	0-1-2-6	3-1-6-13	17-8-8-19	45-22-26-64	157
Total Gapers	30	6	15	13	9	9	23	52		157
Percentage Infected	87	83	53	31	44	33	44	63	59	

* Tabulations of Heavy-Moderate-Light-Negative infections (H-M-L-N)

Summary of Overwintering of D. marinum in Hoghouse Bar Oysters Dredged 1 June 1955 and Held at VIMS Pier for Two Years

J. D. Andrews

22 December 1980

These were market-size oysters found to be 50% infected with D. marinum in the fall of 1954. The plan was to make daily (57, 58) or monthly (60, 61) examinations of the 4 trays to obtain gapers for thioglycollate tests. The daily looks were intended to evaluate the effects of frequent handling on mortality. The series of trays were followed for two years and gave a good picture of seasonal occurrence and timing of Dermo.

About one-third of the dead oysters were recovered as gapers and tested for Dermo (91 of 283 oysters). D. marinum was present as advanced infections almost from the beginning. It was not possible to estimate accurately the percentage of overwintering cases, but from long experience with first year imports of disease-free oysters, I believe that deaths caused by Dermo before the first of August are probably a consequence of overwintering infections. Using this arbitrary cut-off date, 13 cases of Dermo (actually 13 advanced ones) were found. Therefore, as few as 13 oysters out of 690 live oysters (2.2%) may have carried infections through the winter.

Dermo usually does not appear until about 1 June and it needs 30 to 45 days of warm temperatures (above 25°C) to kill oysters. Some infections lag, and I suspect some deaths in August were also derived from overwinter infections in these oysters. The first deaths in disease-free oysters imported in spring usually occur in late August at VIMS Pier where infected oysters always persist.

After the first infected oyster disentegrates in a tray of oysters, a second generation of infections begins which usually culminates in peak death rates in September and October. Because Dermo requires high temperatures to proliferate (25° to 30°C), third generation deaths are usually prevented by arrival of cooler waters in October. By 1 November, deaths cease and a period of expulsion of the pathogen occurs until about mid-December in Virginia. By this time winter temperatures have arrived (5°C) and oysters are inactive for 3 months.

Table 1 shows the seasonality of D. marinum infections in acclimated oysters--those that have been exposed to Dermo the previous summer. Since MSX was not present in Chesapeake Bay in 1955-56, most of the deaths listed in Table 2 were probably caused by Dermo throughout the year. Only 4 of 91 gapers were free of Dermo and another 4 had light infections which usually do not kill oysters. Therefore, 88% of the gapers were killed by Dermo (heavy and moderate infections).

Four months of the year (July to October) are shown to be a major period of mortality from Dermo infections. Occasional deaths from

Dermo are found in other months, although rarely from March through May. These are usually advanced infections that the oysters have not been able to suppress, but other stresses eventually kill the oysters. Removal of gapers daily in Trays 57 and 58 seemed to have no effect in reducing mortality--perhaps because many gapers had partly disintegrated before recovery.

Table 1. Summary of Gaper Diagnoses[1] of Dermocystidium

J. D. Andrews

VFL Pier 1955

Month	Tray 57	Tray 58	Tray 60	Tray 61	All Trays
Jun	-	-	-	1-0-0-0	1-0-0-0
Jul	5-0-0-2	4-1-0-0	-	2-0-0-0	11-1-0-2
Aug	6-1-0-0	9-2-0-0	-	-	15-3-0-0
Sep	13-0-0-1	12-0-1-0	2-0-0-0	4-0-1-0	31-0-2-1
Oct	10-0-0-0	4-0-0-0	1-0-1-0	-	15-0-1-0
Nov	2-0-0-0	1-1-0-0	-	-	3-1-0-0
Dec	1-1-0-0	-	0-0-1-1	-	1-1-1-1
Totals	37-2-0-3	30-4-1-0	3-0-2-1	7-0-1-0	77-6-4-4

Grand Total 77-6-4-4

[1] Intensity of cases given in order heavy, moderate, light, negative.

Table 2. Mortality in Hoghouse Bar Oysters at VIMS Pier from 1 June 1955 to December 1956 Expressed as Number of Dead Oysters - by months

J. D. Andrews

Date	Tray 57[a] (180 oysters)	Tray 58 (170)	Tray 60[b] (161)	Tray 61[c] (180)	Totals
Jun 55	1	0	1	1	3
Jul	9	5	4	6	24
Aug	8	13	12	16	49
Sep	12	13	5	18	48
Oct	10	5	10	16	41
	40	36	32	57	165
Nov	1	2	0	1	4
Dec	4	0	3	0	7
Jan 56	0	1	0	0	1
Feb	2	0	0	1	3
Mar	0	1	0	1	2
Apr	0	0	0	0	0
May	2	0	1	1	4
	9	4	4	4	21
Jun	9	0	3	2	14
Jul	6	2	5	3	16
Aug	5	4	6	4	19
Sep	10	13	6	6	35
Oct	0	3	5	2	10
	30	22	25	17	94
Nov	0	1	0	0	1
Feb 57	1		Dec 1		2
Grand Totals	80	63	62	78	283

[a] Live samples of 25 oysters removed 7 Nov 55, 27 Sep 56, 25 Oct 56.
[b] Live sample on 7 Nov 55; 24 removed to Tray 59 on 5 June 1956.
[c] Live sample on 12 Nov 55; 25 removed for condition index test 30 June 56.

Notes on Problems with Dermo
for Dr. Hewatt
J. D. Andrews
25 June 62

The problem of infecting oysters experimentally with Dermo and following their subsequent growth by in-water weighing is not very challenging in terms of new approaches or new data.

I now have hundreds of records of individual oysters imported at frequent intervals throughout the summer which became infected with Dermo and showed typical weight responses. Since to obtain useful weight changes, it would be necessary to expose experimentally-infected oysters to further infections at VFL pier, the advantages of point-in-time infections would be small. Last summer we imported new susceptibles about every 10 days and thereby essentially obtaining point infections. Also, it would be desirable to have a background of growth on the individuals before infection which would further expose them to "wild" infections.

Lastly this type project can be carried out routinely by my crew of lab technicans with only a minimum of supervision and activity by a scientist. Since it will essentially duplicate data I have collected over the past 5 years, I don't consider it would contribute much to our knowledge of Dermo.

I'm going to suggest several areas which do need some mental consideration and new approaches to fulfill certain needs.

1. Experimental control of Dermo. I am not enthusiastic about the possibility of controlling Dermo in open waters but it would be an

extremely valuable tool if we could do it experimentally. Our effort on MSX is at least doubled by the problem of interference by Dermo.

Hoese and Ray think Cu will kill Dermo. It is possible that freshwater treatments, properly manipulated would be effective and perhaps pesticides could be used or antibiotics. Anyway I would like to be able to treat a batch of oysters and remove all or most of the Dermo. I should think the first approach would be in thioglycollated test tubes.

2. Life Cycle of Dermo. I don't think Mackin is doing much now. Hoese claims to have gotten large sporangia visible to the naked eye (?) by adding CO^2 to cultures. He also claims some waters have an inhibitor. This will be worked on some on Eastern Shore.

3. What is the mechanism of defense in small oysters? Some careful experiments in which dosage was carefully adjusted to meat weight might give a clue to the defense mechanism. We know small oysters can get it and die.

4. What happens in the thioglycollate cultures? Sammy and I have gotten quite disparate results when new antibiotics were added to cultures. Somehow we must resolve our differences. See our correspondence.

5. The related species (?) of Dermo are still relatively untouched except for Macoma. What of the Dermo in the parapodia of polychaetes.

6. Some work on estimating dosage of Dermo--methods of handling--would be valuable.

7. Do infections occur in gills, digestive tract or in any epithelia surface? We have Moto-drills now which make manipulation of oysters for injections, transplants, etc. much easier.

8. Why do oysters imported in the middle of Dermo-infection season appear to get infections more rapidly than acclimated oysters? What are the effects of various physological conditions on Dermo infections? These are some of the questions running thru my mind and you no doubt can think of more. After you have read Hoese's and Sammy's accounts, see if any of these appeal to you.

J. D. A.

Why did prediction of Dermo-caused oyster deaths fail in 1957?

by

J. D. Andrews

23 September 1957

1. Although early temperatures were abnormally high in 1957 (May, June) August was probably below average (cool nights and moderate days). September may prove to be warmer than usual.

2. Proximity factor - I am forced more to the conclusion that oysters in the immediate proximity of disintegrating gapers are predisposed to get Dermo. The V.F.L. pier seems to be a site of intense infestation presumably from holding some rather heavily-infected oysters and dense groups there each year, whereas planted grounds were harvested and fairly-well cleaned of oysters every two or three years.

3. The age of oysters or rather the time at which they were planted in infested areas with respect to Dermo mortalities in the past few years is important. Oysters planted before the summer of 1954 (year of severe Dermo mortalities) died at high rates; those planted after 1 Nov. 1954 died at lesser rates and those planted after 1 Nov. 1955 died hardly at all. Infections were virtually absent in oysters of this latter time category, therefore, infections failed to become established in the summer of 1956 in most oysters.

4. Tray oysters at V.F.L. pier showed persistently higher Dermo activity by a good margin than most natural bottom oysters. Trays

68-73 were exposed in an infested area for the first time in the summer of 1956, yet oyster death rates were exceptionally high in 1957. Trays 74 and 81, contained acclimated 2-year-old oysters that had unusually high death rates. Older oysters seemed to have more moderate losses.

5. It also appears that the fungus may require rather high temperatures to kill many oysters. For example, if the temperature remains above 27° or 28°C for any length of time while oysters are infected, heavy losses can be expected. On the other hand, numerous serious infections may produce only moderate losses if temperatures remain at 25°C or below. This is the situation in 1957. Some batches of tray oysters had nearly half of the oysters with moderate or heavier infections yet deaths were light because the temperature was about 25°C in late summer.

A SUMMARY OF TRAY MORTALITIES AND DERMOCYSTIDIUM MARINUM STUDIES OF OYSTERS IN VIRGINIA IN 1959

Jay D. Andrews, Dexter Haven and Richard Hoese

Virginia Fisheries Laboratory, Gloucester Point, Virginia

20 November 1959

INTRODUCTION

In mid-winter of 1958, the realization that the oyster resources of Delaware Bay had been almost destroyed by unknown agents led to steps designed to detect at an earlier stage any such occurrence in Chesapeake Bay. Oystermen were warned that the causative agents might be transferred to Chesapeake Bay with shipments of Delaware Bay oysters. This possibility was based on the assumption that something new to mid-Atlantic waters had gotten into Delaware Bay. Until causes were more clearly defined, oystermen and biologists had no source of warning other than to watch carefully for unusual mortalities in oysters.

The most feasible method for the Laboratory to monitor areas for oyster deaths was to establish tray stations in as many areas as possible. This was done throughout Eastern and Western Shore of Chesapeake Bay in Virginia with the excellent cooperation from oystermen in setting up and watching trays. About nine months have passed since the first trays were established and this report is an attempt to provide the Laboratory Board and cooperating oystermen with results of the mortality studies.

This report will cover briefly only mortality information from tray studies and tests of oysters for the fungus Dermocystidium. In April a special state appropriation permitted us to hire a microtechnician to prepare slides of oyster tissues and a microbiologist, Dr. John Wood, whose specialities are bacteria and fungi. Their work began in July and now some 1500 gapers and live oysters from all over Virginia are in the process of preparation for study. Almost half of these have been completed and are being studied but results are not available yet. The preparation of each oyster is a long and tedious process. In addition, Mr. Dick Hoese, a biologist, was hired to maintain a substation of the Laboratory on Eastern Shore and since August he has been primarily responsible for the work on Eastern Shore.

SUMMARY OF RESULTS

Perhaps the easiest way to explain what happened in the trays is to give a chronological account of events for each major area. The tray method of study has advantages and limitations which should be understood. The purpose of trays is to provide an ideal environment for oysters by eliminating predators, smothering, and other bottom-associated causes of mortality. Except for smothering in one or two trays on soft bottoms, we have succeeded this summer in eliminating drills and other known killing agents. The deaths in trays can be attributed therefore to diseases or other water-associated agents of unknown character. We have made a vigorous effort to estimate the amount of mortality caused by Dermocystidium, a

known killer of oysters. Finally, for each area we have made a preliminary analysis as to the probable occurrence of unexplained losses.

Obviously, our scattered trays will not detect troubles which have very local distributions, but they have proven reliable in finding seasonal mortalities from unknown causes which were often obscured on planted grounds by predation and smothering losses. Since tray oysters are usually relatively crowded, the activities of infectious diseases are often accentuated in trays as compared to planted or public grounds. Lastly, source of oysters and time of planting can be rigidly controlled in trays. This knowledge of past history of oysters has proven invaluable in interpreting subsequent losses.

1. Seasonal Picture of Mortality on Seaside of Eastern Shore of Virginia

So far Dermocystidium is absent from oyster beds on Seaside. This greatly simplifies the problem of detecting losses from unknown agents. Oysters on Seaside had low rates of loss (about one percent per month is considered a normal base line) until about mid-May. From mid-May to mid-June or July 1, about 10 to 15 percent of oysters in trays died from unknown causes. All trays on Seaside showed about the same amount of losses at the same time; in addition, Fish and Wildlife Service and Maryland laboratories reported losses in trays at the same time, but theirs were somewhat heavier than ours. The mortality stopped as quickly as it began and there have been no significant

losses since early July. The losses in native oysters for the nine month period ranged from 11 to 24 percent in trays. Oysters put in trays after the May-June mortality have had only about two percent losses since mid-June. The low rate of death on Seaside through the hot summer has astonished those of us on Western Shore who are accustomed to big losses from the fungus each summer.

James River seed oysters were put in trays about March 1 and had almost as much mortality as native seed, but two lots planted May 15 and June 15 respectively had only 5 percent deaths. These lots escaped the May-June mortality although one lot was there through that period. The heavy death rate predicted by some oystermen for James River seed oysters planted on Seaside has not occurred.

2. Seasonal Picture in Bayside Creeks on Eastern Shore

Although only a few miles away and in some cases involving seed oysters from Seaside, trays in Bayside creeks did not show the May-June losses. Bayside oysters did not show any appreciable rise from the basic mortality rate of one percent per month until August. Since August 1 about 20 to 30 percent of these oysters have died and the timing plus tests of gapers and live oysters suggest that Dermocystidium probably accounted for most of these losses. The death rate has already returned to the winter level of one percent per month. This agrees perfectly with our knowledge of the seasonal occurrence of deaths from the fungus on Western Shore. At this time

there is no evidence of appreciable unexplained mortalities in the creeks of Bayside, Eastern Shore.

3. Western Shore of Chesapeake Bay, Virginia

In view of the traffic in shells and oysters between Delaware and Eastern Shore, it was anticipated that trouble from the north might arrive there first. Consequently, in the late winter and spring of 1959, we were occupied establishing stations on Eastern Shore. In late spring and early summer, stations were established on Western Shore and 20 trays, exclusive of Gloucester Point, are under observation now.

It is well known by now that heavy losses were experienced on commercial beds in Chesapeake Bay, Mobjack Bay, York River and Hampton Bar this year. We have counted samples from many beds where losses were 40 to 50 percent by box counts. It became obvious in mid-August that a loss of about 20 to 25 percent had occurred on many deep-water beds in the spring. (No! June-July from late-summer infections.) Some of the beds examined in mid-August had also been observed in late February to be in excellent condition with low box counts. The mortality occurred between those two dates, but the boxes were obviously several months old in August. In mid-August recent boxes were not common and it was determined by tests and known from previous experience that Dermocystidium could not have killed many oysters by that time. The cause of this spring mortality is unknown. (It was MSX.) Oysters in trays at Gloucester Point and in the Rappahannock

River, all shallow-water stations, did not have this spring mortality, therefore, we had no warning of its occurrence in the Chesapeake Bay proper.

With 20 to 25 percent of lower Bay oysters already dead in early summer, the stage was set for a real bad year even if Dermocystidium killed only its usual 20 to 30 percent during the warm season. Unfortunately, this year was extraordinarily favorable for fungus losses because the warm season persisted long into the fall. According to our records of ten years, this year is matched only by 1954 in intensity of losses from Dermocystidium.

Most trays established on Western Shore were filled with Dermocystidium-free oysters from James River in the hope that fungus activity would be negligible the first summer in infested waters--losses are usually less than 10 percent the first summer. This would have provided the best possible check for unusual oyster mortality agents in high-salinity waters. However, the losses in first-summer oysters in trays ranged from 17 to 44 percent--far above normal. Only in low-salinity waters, far up the rivers where Dermocystidium was absent, were losses normal. At VFL pier where groups of acclimated oysters were held, mortalities averaged about 50 percent for the warm season June to November--apparently almost all of which was caused by Dermocystidium.

Since mid-August we have tested 102 samples, each of 25 live oysters, as well as hundreds of gapers in attempts to evaluate the

role of Dermocystidium in this year's excessive losses. With few exceptions, distribution and intensity of the fungus seemed to match summer losses. There is no sure way to confirm the causes of all deaths in a group of oysters except to examine each gaper or dying oyster. This we can do only at Gloucester Point by daily examinations of our pier trays; tests of gapers indicated that approximately 95 percent had serious infections of Dermocystidium this summer. This is almost exactly the rate we have obtained for many summers past in trays at Gloucester Point.

It is important to note that low-salinity stations where Dermocystidium is absent or unimportant have revealed low mortalities in tray oysters. Wreck Shoal in James River, Bowlers Rock in Rappahannock River, and Nomini Creek and Little Wicomico River are stations where mortalities are less than 10 percent for the summer. Of course, other mortality agents may be absent from low-salinity waters also--for example, in Delaware Bay, troubles were much less severe in the upper seed beds.

Very few oyster diseases are known as yet, therefore, further studies may reveal that other death agents are involved substantially in summer mortalities, but at present it still appears that Dermocystidium is the chief killer.

DISCUSSION

It would be foolish to assume that the losses of 1959 will not occur again even though Dermocystidium and warm weather seem to have

played so large a part. In the first place the spring mortality is quite unexplained and we are unable to say whether it will occur again. We must remember that in Delaware Bay the first big loss was a spring (?) mortality (1957) but this was not followed by another big loss until the fall a year and one-half later (1958) when a large, new crop of oysters had been planted. Dr. Haskin of New Jesey informs us that heavy losses have occurred this fall in tray oysters at Cape May. We provided him with four lots of James River seed oysters for testing in Delaware waters. These lots were moved in April and June and began dying with native oysters in mid-August. Upwards of 50 percent have died (from MSX!). These oysters, which were free of Dermocystidium when sent to Dr. Haskin, do not have much of the fungus yet; therefore, the heavy mortality cannot be blamed on Dermocystidium. These lots of James River oysters will be valuable to us and to Dr. Haskin in determining when infections of the Delaware Bay disease occur and the course of events in each of the seasons of the year.

We intend to continue our vigilance in every season of the year. The present set of about 50 trays of oysters will be replaced and supplemented as needed. The deeper, more open waters of Chesapeake and Mobjack bays are not covered by trays at present, and trays will be difficult to maintain in these areas.

To the best of our knowledge, mortalities have almost ceased in all waters of Virginia as winter begins. This is true of all our trays including those observed at frequent intervals at Gloucester Point. It is usual for deaths from Dermocystidium to stop by November

1 and not to be resumed until July of the following year. Any appreciable losses during the winter--barring smothering or other obvious causes--is not normal and should be reported. The end-of-winter is a period which should be watched carefully this year for small losses have been observed then almost every year particularly in South Carolina oysters. From the end of February through April is a period when oysters are emerging from winter dormancy and sick or weak oysters frequently become gapers.

It is our intention to provide each cooperating observer with a detailed record of the mortalities in trays in his area. In addition, we have prepared tables summarizing all data for Eastern and Western shores. Also tables giving detailed accounts of the seasonal distribution of deaths in typical trays for each major area are available. These tables will be provided upon request.

4 February 1981. It is now known that the May-June 1959 mortalities of oysters on Seaside were caused by SSO. The mortalities in the summer of 1959 in Mobjack Bay and Chesapeake Bay deep-water beds were caused by MSX.

Tray-Lots of Oysters Held at VIMS Pier,
Gloucester Point, Va. for Mortality Studies*, 1950-67

Tray No.	Source of Oysters	Date Tray Initiated	Date Tray Closed	Comments
1	Brown Shoals, J. R.	27 Jun 50	31 Aug 58	Dermo mort.
2	Deep Water Shoal	28 Jun 50	30 Sep 58	" "
3	Hoghouse, Rapp. R.	14 Jul 50	31 Oct 58	" "
4	We Creek, S. Carolina	11 Jul 51	28 Feb 59	spat, 1951
5	Hog Is. Bay, Seaside	1 Sep 51	27 Oct 54	1950 set
6	Wreck Shoal, J. R.	28 Sep 51	31 Oct 58	size vs mort.
7	Wreck Shoal, J. R.	28 Sep 51	31 Oct 59	"
8	Wreck Shoal, J. R.	28 Sep 51	31 Oct 58	"
9	Wreck Shoal, J. R.	28 Sep 51	29 Oct 58	"
10	Hoghouse spat	15 Nov 51	6 Nov 57	age vs mort.
11	Wreck Shoal spat	30 Nov 51	6 Nov 57	"
12	Island Bar spat	19 Jun 52	31 Oct 59	"
13	York R., 1948 yr. cl.	19 Mar 52		old oysters
14	Ross Rock, Rapp. R.	10 Jun 52	31 May 54	"
15	Hog Is. Bay, 1952 set	27 Jul 53	27 Oct 54	seaside
16	Hoghouse spat 1952 set	21 Oct 52	27 Oct 54	low sal. exp.
16a	Hoghouse to J.R. Fleet Pier	5 May 54		"
16b	Hoghouse to J.R. Fleet Pier	30 Aug 54		"
17-20	Wreck Shoal	30 Apr 53	3 Feb 54	"
21-24	Hoghouse markets	7 May 53	1 Oct 54	seasonality
25	Drummond gr., Rapp. R.	18 Dec 52	6 Nov 57	"
26	Corrotoman R.	28 May	31 Oct 60	"
27	VIMS Pier 1952 set	10 Apr 56	14 Sep 59	"
28	S. Carolina 1952 set	1 Feb 56	6 Oct 59	resistance
29	Hoghouse, Sitterdings Dock	14 Jul 53	3 Sep 54	wt. vs Dermo
30	no record			
31	Wreck Shoal at Fleets Pier	16 Jul 53	May 55	low salinity
32	Wreck Shoal at Fleets Pier	16 Jul 53	May 55	
33	VIMS Pier 1952 set	11 Sep 53	8 Nov 57	
34-36	no record			
37	James River 1952 set	20 Feb 54	8 Nov 57	
38	S. Carolina 1953 set	Nov 53	29 Feb 60	resistance
39	Chincoteague 1953 set	27 Jan 54	6 Nov 57	"
40	York River 1953 set	10 Sep 55	31 Oct 60	"
41	Deep Water Shoal	14 Jun 54	31 Oct 56	
42	Ferry Pier, VIMS	14 Jul 54	31 Jul 59	
43	Hoghouse	28 Jul 54	15 Jun 59	
44	no record			
45	no record			
46	no record			
47	Pages Rock, Y. R.	9 Feb 55	18 Nov 58	

* A few moved to other sites for monitoring as specified

Tray No.	Source of Oysters	Date Tray Initiated	Date Tray Closed	Comments
48	Pages Rock, Y. R.	9 Feb 55	5 Jul 61	
49-53	no record			
54-55	Rapp. R. to Fleet Pier, J.R.	lost to hurricane Aug 55		low salinity Dermo exp.
56-62	no record			
63b	J. R. red-painted	11 Jun 55	lost winter 1956-57	
65	James River	11 Jul 55	lost winter 1956-57	
66	Deep Water Shoal to Fl. Pr.	55	lost Aug. 55 hurricane	
67	Deep Water Shoal to Fl. Pr.	6 Jan 56	17 Oct 57	
68	Horsehead	8 Feb 56	11 Nov 57	
69	Horsehead	8 Feb 56	1 Nov 57	
70	Hog Is. Bay	21 Feb 56	1 Nov 57	
71	Hog Is. Bay	21 Feb 56	31 Aug 57	
72	Middle gr., Del. Bay	5 Mar 56	31 Oct 57	resistance
73	Middle gr., Del. Bay	5 Mar 56	31 Oct 57	"
74	VIMS Pier 1955 set	30 Apr 56	9 Nov 60	
75	Wreck Shoal 1955 spat	30 Apr 56	31 Oct 60	
76	VIMS Pier 1955 set	30 Apr 56	31 Oct 60	
77-79	lost in James River	spring 56	fall 56	
80	S. Carolina set 1955	8 May 56	28 Feb 61	resistance
81	Seaside 1955 set	16 Nov 56	10 Nov 60	"
82	J. R. seed in Rapp. R.	2 Oct 56	2 Oct 57	timing of infection
83	J. R. at Tillages	8 Jun 56	4 Oct 57	"
84	J. R. off VIMS	26 Mar 56	29 Oct 57	"
85	J. R. at Hoghouse	26 Mar 57	4 Nov 57	"
86	J. R. at Darlings Watch H.	28 Mar 57	4 Nov 57	"
87	J. R. off VIMS	26 Mar 57	29 Oct 57	"
88	J. R. off VIMS	26 Mar 57	18 Jun 58	lost
89	Y. R. at Tillages	7 Jun 57	31 Oct 59	
90	Y. R. at Tillages	11 Jun 57	16 Dec 60	
91	Deepwater Shoals	12 Jun 57	31 Oct 59	
92-93	Deepwater Shoals	8 Jul 57	31 Jul 57	
94	S. Carolina	6 Dec 57	16 Aug 61	resistance
95	S. Carolina	6 Dec 57	29 Feb 60	"
96	Y. R. spat	11 Aug 58	30 Apr 60	
97	Wreck Shoals	5 Aug 58	25 May 61	
98	Smith Cr., Md. 1958	8 Jun 59	31 May 61	susceptible
99				
100	Ferry Pier	31 Jul 58	29 Mar 60	
101-101a	N. Carolina	27 May 58	17 Apr 64	
102	J. R. 1958 set	27 Oct 58	25 Jul 61	
103	J. R. 1958 set	27 Oct 58	9 Nov 60	
104	VIMS 1958 set	9 Jan 59	31 May 61	
105	Wreck Shoals	24 Nov 59	31 Mar 61	
106	Bowlers Rock	4 Dec 59	31 Mar 61	
107-110	no record			
111	S. Carolina 1959 set	15 Jan 60	18 Aug 61	resistance

Tray No.	Source of Oysters	Date Tray Initiated	Date Tray Closed	Comments
112	Wreck Shoal	15 Feb 60	10 Apr 63	
113	Deep Water Shoal	31 Mar 60	25 Oct 61	
114	Deep Water Shoal	28 May 60	4 Aug 61	
115	N. Carolina markets	22 Mar 60	29 Mar 61	MSX
116	Potomac R.	26 Aug 60	21 May 62	MSX suscep.
117	Horsehead	14 Jul 60	30 Aug 62	
118	Horsehead	26 Aug 60	25 Oct 61	
119-119a	J. R. 1959 shellbags	25 Aug 60	17 Apr 64	
120	Horsehead	20 Sep 60	25 Oct 61	
121	Horsehead	13 Oct 60	25 Oct 61	
122	J. R. shellstrike	24 Oct 60	31 Jul 62	
123	Horsehead	28 Feb 61	17 Apr 64	
124	Seaside	8 Jan 61	27 May 63	
125	Wachapreague spat	1 May 61	31 Mar 63	MSX suscep.
126	Wreck Shoal	27 Mar 61	31 Jul 63	
127	Horsehead	27 Mar 61	12 Oct 62	
128	Horsehead	27 Mar 61	25 Oct 61	
129	Horsehead	3 May 61	10 Apr 63	
130	Mobjack, Plot 9	16 May 61	16 Jun 67	
131	Hog Is. Bay	24 May 61	31 Jul 62	
132	VIMS acclimated oysters	24 May 61	27 Oct 61	
133L	Horsehead	5 Jun 61	1 Jun 62	
133a	Horsehead	5 Jun 61	16 May 62	
133b	Horsehead	5 Jun 61	9 Jan 62	
133S	Horsehead	5 Jun 61	31 Oct 62	
134	Horsehead	5 Jul 61	2 Aug 63	
135	Horsehead	21 Jul 61	31 Aug 62	
136	J. R. 1960 set	27 Jul 61	17 Apr 64	
137	Horsehead	1 Aug 61	31 Jul 62	
138	Horsehead	22 Aug 61	20 Apr 64	
139	Horsehead	5 Sep 61	31 Aug 62	
140	Horsehead	6 Nov 61	2 Aug 63	
141	Mobjack 1961 set	23 Oct 61	16 Jun 65	
142	Wreck Shoal	31 Mar 62	20 Apr 64	
143	Horsehead	2 May 62	20 Apr 64	
144	Long Is. Lab bred 1961	31 May 62	30 Jun 63	
145	Delaware Bay 1960	14 May 62	31 Jul 63	resistance
146	Delaware spat 1961	14 May 62	8 Aug 63?	
147	Horsehead	26 Jun 62	20 Apr 64	
148	Horsehead	30 Jul 62	31 Mar 64	
149	Wreck Shoals	31 Aug 62	8 Nov 63	
150	Horsehead	9 Apr 63	14 Apr 65	
151	Wreck Shoal 1962	9 Aug 63	9 Nov 64	
152	Horsehead	12 Aug 63	5 Aug 65	
153	Horsehead, MSX inf. exp.	30 Sep 63	29 Jan 64	
154	J. R. shellbag 1963	5 Mar 64	15 Sep 66	
155	Piankatank 1963 set	4 Dec 63	spring 66	
156	Horsehead	15 Apr 64	10 Oct 66	
157	Mobjack survivors	13 Apr 65	28 Mar 67	

Notes on Dermo Activity in 1959, a Pre-MSX Year

J. D. Andrews

VIMS, 4 February 1981

The year 1959 was second only to 1954 in the high level of Dermo activity in Virginia. This pre-MSX year represented the all-time peak quantities of oyster planting on private grounds in Virginia. The threat of MSX invading Virginia caused me to establish tray stations in all major rivers where planting was extensive in the spring and summer of 1959. The objective was to monitor beds for MSX invasion, but our best judgement is that MSX was confined to Chesapeake Bay and Mobjack Bay beds in 1959. This area is represented by the big circle on the MSX distribution figure in the 1967 paper by Andrews and Wood. In 1960, MSX spread almost to its full distribution in Virginia. Nineteen fifty-nine was the last chance to monitor Dermo activity before MSX killed most oysters in high-salinity areas and depressed D. marinum activity in the 1960's and 1970's.

The year 1958 was a cold, late, wet summer that should have inhibited Dermo, and the extensive sampling confirmed low prevalences and low weighted incidences, except at VIMS Pier where they were moderately high. A survey of Ballard's private beds off Egg Island and New Point Comfort in the open Chesapeake Bay in February 1959 showed low mortalities and the best prospects for good oyster yields in years. By late-summer 1959, these beds had been devastated by MSX. Dermo activity was fairly light in 1959 on these Bay beds (see Mobjack Bay in 1958 Dermo-test tables).

Oysters with two kinds of histories were placed in trays for monitoring Dermo in 1959. Wreck Shoal oysters from James River were used as disease-free importations, and acclimated oysters that had been on the local beds at least through 1958 were also placed in trays. Most of the latter oysters were also James River seed oysters planted a year or two earlier. It was standard practice then to hold James River seed oysters three years before marketing. Diseases, and our repeated urging to harvest earlier, finally resulted in much quicker harvesting--after only one year of growth even, when seed oysters were large, as in the early 1960's following failure of spatfall in the James River.

There was no attempt to avoid native or planted oyster beds in the 1950's as our objective was to use trays of oysters to represent Dermo activity levels on beds. We could and did sample the beds for Dermo, but smothering and other causes of mortality were eliminated in legged trays set on the beds. In the 1960's and 1970's when studying MSX, we abandoned VIMS Pier for monitoring diseases and tried to isolate trays of oysters from each other and from native oysters to reduce or eliminate Dermo. This should be kept in mind when comparing pre- and post-MSX Dermo data. Most of the monitoring stations had far fewer oysters in the post-MSX era than in the pre-MSX one.

The table listing Dermo tests in 1959 gives dates of observations and mortalities along with Dermo prevalences. In each river the low-salinity stations are listed first. Roanes Pt. and Bowlers Rock stations probably had no Dermo although tests were not made. It will

be seen that acclimated oysters exhibited higher prevalences and weighted incidences than newly-imported oysters. Presumably some infections were carried over from the previous year in these acclimated oysters, thereby providing a close-proximity source of infection from within the tray (see J4 and J5, and R3 vs R2 and R4). However, there appeared to be infective sources close to the trays, for even lots imported as late as 22 July had substantial infections by late October. The high level of Dermo at Ellens Island can be attributed to location of the trays at the Amoco survey tower with wild oysters growing on the pilings. The trays were let down through a trap door into the center of the pilings to avoid vandalism. It was a replication of conditions at VIMS Pier where Dermo was always high in activity.

Some of the duplicate trays show fairly close prevalences and weighted incidences (e.g. Y4 and Y5), whereas others vary more (e.g. R4 and R5). This variance can result from one early Dermo-infected oyster dying in one tray and not in the other. There is a reasonable relationship between prevalences or weighted incidences and mortalities. The high mortalities in Y6 and Y7, both newly imported Wreck Shoal oysters in March 1959, demonstrate the losses that can occur if acclimated oysters are in close proximity to the new lots. This means that planting disease-free seed oysters on a bed with some old infected oysters can be disastrous. Either the beds should be fallowed for a couple of years to allow the old oysters to sink or die, or the beds must be cleaned beyond the usual two-thirds recovery of planted oysters. Both cultural practices are costly where Dermo is

a problem. The problem in managing shelly public rocks is that oysters are never completely removed, and it is undesirable from the standpoint of repletion and attraction of spatfall by aggregation. Oyster larvae are much more likely to set where other oysters are already growing.

The number of months monitored is not very significant in Dermo infections and mortalities provided the oysters are exposed when the earliest over-wintering infections of Dermo cause deaths, usually in July. Dermo deaths usually cease 1 November each year, therefore, mortalities from the pathogen occur primarily in August, September and October. Testing for maximum level of Dermo infection should be delayed until late September or early October for comparison of years or sites. Once weighted intensity has exceeded about 1.0, deaths tend to remove advanced infections about as rapidly as new infections progress to the killing intensity. Mortalities were exceptionally low at Hoghouse Bar in the Rappahannock River for the intensities of Dermo infection (R2 and R4). Another week or two of warm fall weather could have doubled the mortality rates. A prolonged warm fall occurred in 1959.

The mortality rates at Hampton Bar (25% and 32%) are considered typical for an average or better Dermo year in a well-populated bed of acclimated oysters. It is unusual to get 25% deaths in newly-imported lots the first year.

The data in Table 1 do illustrate what happens on beds of planted oysters in a year of above average Dermo activity. However, both

public and private beds have been essentially barren of oysters in the high-salinity waters of lower Chesapeake Bay since 1960. Dermo will remain depressed except in localized situations until populations of oysters recover to the 1950's level.

Table 1. Mortalities and Prevalences of D. marinum in Tray Oysters in Virginia Rivers, 1959

Location	Tray No.	Source of Oysters	Period of Observation	Months Monitored	Seasonal Mort. %	Dermo Prevalences		
						Date Sampled	Percent Infected	Weighted Incidence
James River, 1959								
Wreck Shoals	J1	natives	26 May-20 Nov	6	8	13 Oct	8	0.16
Hampton Bar	J4	acclimated[1]	21 May-29 Oct	5+	32	28 Aug	72	1.20
Hampton Bar	J5	Wreck Shoals	21 May-29 Oct	5+	25	28 Aug	12	0.28
York River, 1959								
Mt. Folly	Y1	Wreck Shoals	27 May-16 Nov	5+	3	24 Sep	0	0
Mt. Folly	Y2	Seasides	27 May-16 Nov	5+	12	24 Sep	0	0
Roanes Pt.	Y8	Wreck Shoals	9 Mar-5 Oct	7	5	-	-	-
Tillages	Y3	Wreck Shoals	14 Mar-9 Oct	8	21	19 Oct	32	0.76
Tillages	Y4*	Wreck Shoals	22 Jul-9 Nov	3+	14	19 Oct	28	0.60
Tillages	Y5*	Wreck Shoals	22 Jul-9 Nov	3+	12	19 Oct	32	0.64
Ellens Is.	Y6*	Wreck Shoals	11 Mar-16 Oct	7	40	16 Oct	92	1.84
Ellens Is.	Y7*	Wreck Shoals	11 Mar-16 Oct	7	44	16 Oct	96	2.32
Severn R.	SV1	acclimated	Jul-21 Oct	3	15	15 Oct	60	0.92
Rappahannock River, 1959								
Bowlers Rock	R1	natives	6 Jul-2 Nov	4	2	-	-	-
Hoghouse	R2	J. R. seed	14 Mar-2 Nov	7+	16	28 Aug	32	0.72
Hoghouse	R2	J. R. seed	14 Mar-2 Nov	7+	16	7 Oct	60	1.00
Hoghouse	R3	natives	1 Jun-2 Nov	5	16	7 Oct	80	2.04
Hoghouse	R4*	J. R. seed	22 Jul-2 Nov	3+	12	7 Oct	56	1.12
Hoghouse	R5*	J. R. seed	22 Jul-2 Nov	3+	6	7 Oct	24	0.40
Little Wic.[2]	LW1	J. R. seed	4 Jun-5 Nov	5	10	2 Sep	8	0.24
Nomini Cr.[2]	N1	J. R. seed	19 May-5 Nov	6	5	2 Sep	8	0.08
Nomini Cr.[2]	N2	acclimated	19 May-5 Nov	6	4	-	-	-

[1] James River seed oysters exposed one or more summers at the disignated tray site

[2] Acclimated oysters near tray sampled * Duplicate trays

The Early Deaths of Oysters in Trays at VIMS Pier from Dermocystidium in 1957

by

Jay D. Andrews

A warm May in 1957 warmed the waters to summer levels early and continued warm weather in June (except for a cool week at the beginning) has initiated deaths of oysters from Dermo two to three weeks early. I believe the usual May-June mortality, from causes other than Dermo, was pushed mostly into May (Table 1). May mortalities were up considerably this year over the previous two years. June losses were no greater than last year since the optimum temperature range for the late spring mortalities was passed in May evidently. Although Dermo losses appear to be earlier than in most years, only abut 1/4 of the June deaths could be attributed to this cause. Typically Dermo-infested gapers are rare in June but begin to appear early in July.

In Table 2 are data on the death rates of James River, Delaware River, and Seaside oysters entering their first season as acclimated oysters. The death rates for May and June appear to be high, but the astounding occurrence of heavy infections of Dermo (71 per cent) is a strong warning of things to come. It will be seen that previous to 1957, heavy infections were rare in May and June.

There is also a suggestion here that a new lot of acclimated oysters not previously subjected to summer losses from Dermo (Table 2)

may experience much heavier mortality than a group of old acclimated oysters (Table 1). This is apparent even though 1956 was a mild year for Dermo and the new oysters probably entered the cold season period with fewer infections than the old acclimated oysters. The high early death rate is surprising in view of the low level of mortality in 1956. It provides strong evidence against the view that oysters are able to discard infections during the winter season.

One now wonders if the first deaths from Dermo in the early summer are from over-wintering infections. I have long held this belief, and that further deaths must await the month-long period of incubation after disintegration of the first gapers and subsequent development of lethal infections. If so, one might reasonably expect to find an early-season, low-mortality peak followed by a drop in the death rate. Calculation of daily death rates for all oysters might show this.

TABLE 1
Mortality of native acclimated oysters in May and June
at VIMS Pier

Tray No.	Percentages 1955 May	1955 June	1956 May	1956 June	1957 May	1957 June
1 to 3 & 6 to 10	2.9	3.3	1.1	3.3	5.8	3.0
11 & 12	1.7	2.8	1.0	4.1	6.8	7.3
25 & 26	1.3	0.9	1.3	2.6	3.7	3.8
33, 37, 40	1.0	1.2	3.0	3.8	2.6	2.6
Averages for all oysters	1.5	1.7	1.8	3.3	4.2	3.6
Total May-June Mortality	3.2		5.1		7.8	
Intensity of infection	No. of Dermo infections (trays 1-40)					
Heavy	0	2	0	0	0	6
Moderate	1	1	1	1	0	2
Light	6	6	1	1	1	2
Negative	13	26	15	22	10	13
Advanced infections 35%						

TABLE 2
Mortality of James River, Delaware Bay and Seaside (HIB) oysters,
at VIMS Pier 1957

Source	Tray	Percentages May by trays	May Source groups	June by trays	June groups	Totals for groups
JR	68	1.3	0.86	5.2	4.9	5.6
	69	0.6		4.8		
HIB	70	4.8	4.4	5.0	5.7	10.1
	71	4.1		6.5		
DB	72	2.7	2.4	6.1	6.7	9.1
	73	2.1		7.2		
		May		June		
Dermo Infections		2 moderate 6 Negative		29 Heavy 1 Light 11 Negative		(71%)

Post-MSX activity of Perkinsus marinus (Dermo) in gapers from trays located on natural oyster beds

J. D. Andrews

7 February 1983

All these oysters were transplanted from the James River seed area to natural beds in three major rivers to monitor MSX. Most were imported in spring (March to May) as disease-free oysters. Most monitoring stations were in fairly low-salinity areas relatively free of MSX and Dermo, or were located on natural beds with low populations of oysters. Therefore, these lots of test oysters were relatively isolated from oysters containing Dermo infections. This contrasts sharply with similar disease-free lots imported to VIMS Pier (prior to 1960) where crowding of oysters and trays, plus occurrence of infected wild oysters on pilings, provided optimum conditions for spread of Dermo infections.

The prime purpose of monitoring oysters on sparsely populated natural oyster beds was to study seasonality and distribution of MSX without interference by Dermo. Prior to 1960 most Dermo studies were conducted at VIMS Pier; after the appearance of MSX in 1959, most studies were conducted away from piers and pilings where Dermo persisted in native oysters.

Dermo declined in lower Chesapeake Bay abruptly after 1960 from the high VIMS Pier levels of prevalences and mortalities to low ones in offshore trays. This was primarily due to the rapid reduction of oyster populations everywhere in high-salinity waters. Few private beds were replanted and public beds were slow to replenish populations because of low

setting rates. Also, interference by MSX was intensive. It infected oysters more intensively and killed them more rapidly than Dermo could. Dermo gets a later and slower seasonal start each year from hidden over-wintering infections.

Data for three post-MSX years of intensive monitoring of Dermo are shown in Tables 16, 16a, and 17 (1966 to 1968). Prevalences of Dermo were very low in gapers from trays in all three rivers. In only two instances were Dermo-caused mortalities (heavy and mod. infections) above 10% of gapers; these were in trays in their third or fourth year of exposure to diseases in the area (1964 progeny off VIMS in 1968, Table 17), or on beds where significant populations of infected native oysters remained that escaped the ravages of MSX (J15 on Brown Shoal in 1966, Table 16).

It would be expected that the light cases of Dermo were in gapers killed by MSX (concurrent infections), and perhaps some moderate infections, for Dermo does not usually kill until intensive infections are achieved. Dermo infections were rare in trays in the Rappahannock River where the disease is nearly always present at low levels from the river mouth to Morattico bar. Low spring salinities inhibit the disease, and populations of native oysters remained low on public beds through the 1960's and the 1970's despite near absence of MSX. Dermo has been absent from private beds in Mobjack Bay that were not replanted after 1960. Also, both in the Rappahannock River and Mobjack Bay, it was difficult to maintain trays more than one year due to vandalism and haul-seining; therefore, Dermo had little chance to become established in trays supplied with new disease-free oysters each year. Haul-seining has apparently ceased in recent years.

These tables do not show the occurrence of MSX, but it was high in prevalence in live oysters and gapers in all areas monitored except the Rappahannock River and the James River seed area above Brown Shoals.

Table 16

Prevalences and Intensities of P. marinus (Dermo)
in Gapers from Virginian Waters, 1966

Location or Tray No.	Date imported[1]	No. of gapers tested	No. Infections by intensities H	M	L	N	Percent infected	Weighted Incidence
			James River					
J12 HB	Apr 64	1	1				100	5.00
J14 HB	Mar 64	27				27	0	0
J15 BS	Apr 66	25	6	1	5	13	48	1.52
J16 WS	Jun 66	1				1	0	0
	Totals	54	7	1	5	41	24	0.80
			York River					
Y15 TG	Apr 62	1				1	0	0
Y21 TG	Sep 64	10				10	0	0
Y22 TG	Apr 65	39				39	0	0
Y23 TG	Apr 65	3				3	0	0
Y24* TG	Apr 65	1				1	0	0
Y25 TG	Aug 65	68	5	1		62	9	0.41
Y26 TG	Feb 66	41	1			40	2	0.12
Y27 TG	Mar 66	9				9	0	0
Y28 TG	Apr 66	29				29	0	0
Y29 TG	Apr 66	40	1			39	2	0.13
Y30* TG	Jun 66	8				8	0	0
Y31* TG	Jun 66	70			2	68	3	0.03
Y32* TG	Jun 66	58	1		3	54	7	0.14
Y34 TG	Aug 66	4				4	0	0
	Totals	381	8	1	5	367	2.7	0.13
			Mobjack Bay					
MJ6*	Oct 65	15				15	0	0
MJ13	Apr 65	62				62	0	0
MJ14	Aug 65	49	2			47	4	0.20
MJ15	Feb 66	30				30	0	0
	Totals	156	2			154	1+	0.06
			Rappahannock River					
R10* BW	Aug 61	2				2	0	0
R12 HHB	Apr 66	9				9	0	0
	Totals	11				11	0	0

[1]Yearclass of Lab-bred progeny.
* See list of tray histories for origin of oysters - not from James River seed area.

Location or Tray No.	Date imported	No. of gapers tested	No. Infections by intensities				Percent infected	Weighted Incidence
			H	M	L	N		
		Progeny Lots at VIMS Pier						
1	1964	1				1	0	0
141	1974	3			1	2	33	0.33
145	1974	1				1	0	0
146	1974	3				3	0	0
152	1974	3				3	0	0
154	1975	5				5	0	0
155	1975	14				14	0	0
156	1975	8	1			7	13	0.63
157	1975	6		1		5	12	0.50
FP1		6				6	0	0
FP2		7			1	6	14	0.14
RE1	Old Survivors*	12				12	0	0
RE3	Old Survivors	15	1		4	10	33	0.60
RE4	Old Survivors	4	1		1	2	50	1.50
RE5	Old Survivors	8			2	6	25	0.25
RP1	Potomac R. 1964	14				14	0	0
RM1	Old Survivors	5				5	0	0
RM3	Old Survivors	3			1	2	33	0.33
RM4	Old Survivors	7				7	0	0
RM5	Old Survivors	21	4			17	19	0.95
HB	Old Survivors	4				4	0	0
HB1	Old Survivors	10		2		8	20	0.60
DB1	Delaware Bay 1964	32	7	1	3	21	34	1.28

* Old survivors dredged at Egg Island (RE), Mobjack Bay (RM), and Hampton Bar (HB), and picked from Ferry Pier at VIMS (FP) in spring of 1964 for monitoring in trays--1958 or earlier yearclasses.

Table 16a

Prevalences and Intensities of P. marinus (Dermo)
in Gapers from Virginia Waters, 1967

Location or Tray No.	Date imported	No. of gapers tested	No. Infections by intensities H	M	L	N	Percent infected	Weighted Incidence
		James River						
J14 HB	Mar 64	27	1		1	25	7	0.21
J15 BS	Apr 66	13				13	0	0
J16 WS	Jun 66	10				10	0	0
J17 WS	Apr 67	25			1	24	4	0.04
J18 HB	Apr 67	8				8	0	0
J19 WS	Apr 67	2				2	0	0
		85	1	—	2	82	3+	0.08
		York River						
Y22 TG	Apr 65	12	1			11	8	0.42
Y24* TG	Apr 65	1				1	0	0
Y25 TG	Aug 65	3		1		2	33	1.00
Y27* Gl. Pt.	Mar 66	4				4	0	0
Y28 Gl. Pt.	Apr 66	26	1			25	4	0.18
Y29 AM	Apr 66	23			1	22	4	0.04
Y30* Gl. Pt.	Jun 66	5				5	0	0
Y31* Gl. Pt.	Jun 66	11				11	0	0
Y32* Gl. Pt.	Jun 66	32				32	0	0
Y33		7				7	0	0
Y34 TG	Aug 66	60			1	59	2	0.02
Y35 Gl. Pt.	Aug 66	54			1	53	2	0.02
Y36 Gl. Pt.	Mar 67	30			1	29	3	0.03
Y37 TG	Mar 67	54			2	52	4	0.04
Y38* TG	Mar 67	15	3		1	11	27	1.07
Y39* TG	Mar 67	5				5	0	0
Y40* TG	Apr 67	72			1	71	1	0.01
Y41* TG	Apr 67	66			4	62	6	0.06
Y42 Gl. Pt.	Jun 67	33			1	32	3	0.03
Y43 Gl. Pt.	Aug 67	1				1	0	0
Y44 Gl. Pt.	Sep 67	9				9	0	0
Y45 TG	Sep 67	6				6	0	0
		529	5	1	13	510	3.6	0.08
		Mobjack Bay (1967)						
MJ6	Oct 65	8				8	0	0
MJ14	Aug 65	18				18	0	0
MJ15	Feb 66	35				35	0	0
MJ16	Feb 66	21				21	0	0
MJ17	Apr 67	32				32	0	0
		114				114	0	0
		Rappahannock River						
R13 HB	Mar 67	3				3	0	0

*See list of tray histories for origin of these oysters not from James River seed area. TG = Tillages Ground

Table 17

Prevalences and Intensities of *P. marinus* (Dermo) in Gapers from Virginian Waters, 1968

Location or Tray No.	Date imported	No. of gapers tested	No. Infections by intensities H	M	L	N	Percent infected	Weighted Incidence
		James River						
J16 WS	Jun 66	11				11	0	0
J17 WS	Apr 67	15				15	0	0
J18 HB	Apr 67	29				29	0	0
J19* WS	Apr 67	2				2	0	0
J20 BS	Jun 68	6				6	0	0
J21 HB	Jun 68	7				7	0	0
		York River						
Y22 TG	Apr 65	3				3	0	0
Y24* TG	Apr 65	3				3	0	0
Y27* Gl. Pt.	Mar 66	1				1	0	0
Y28 Gl. Pt.	Apr 66	1				1	0	0
Y33		11	4	1		6	45	2.09
Y34 TG	Aug 66	10				10	0	0
Y36 Gl. Pt.	Mar 67	17				17	0	0
Y37 TG	Mar 67	15				15	0	0
Y38* Gl. Pt.	Mar 67	7				7	0	0
Y39* Gl. Pt.	Mar 67	8				8	0	0
Y40* TG	Apr 67	41	1			40	2	0.12
Y41* TG	Apr 67	4				4	0	0
Y42 Gl. Pt.	Jun 67	2				2	0	0
Y43 Gl. Pt.	Aug 67	28		1	1	26	7	0.14
Y44 Gl. Pt.	Sep 67	17				17	0	0
Y45 TG	Sep 67	37			1	36	3	0.03
Y46 Gl. Pt.	Sep 67	6				6	0	0
Y47 TG	Mar 68	22			2	20	9	0.09
Y48 Gl. Pt.	Mar 68	40			4	36	10	0.10
Y49 Gl. Pt.	Apr 68	53	1	1	4	47	11	0.23
Y50 Gl. Pt.	Apr 68	27				27	0	0
Y51 Gl. Pt.	Apr 68	59	1	1	1	56	5	0.15
Y52 Gl. Pt.	Jun 68	20			3	17	15	0.15
Y53 Gl. Pt.	Jun 68	29	2	1	2	24	17	0.52
Y54 Gl. Pt.	Aug 68	9	1			8	11	0.56
RM1 Old Survivors	1964	1				1	0	0
RE1 Old Survivors	1964	2				2	0	0
HB2 Old Survivors	1964	4	1			3	25	1.25

Location or Tray No.	Date imported	No. of gapers tested	No. Infections by intensities H	M	L	N	Percent infected	Weighted Incidence
		Progeny Lots off VIMS						
P6C	1964	16	4	1		11	31	1.44
P6X	1964	15	10			5	67	3.33
P6a	1964	37	17	4	1	15	59	2.65
P7c	1964	6	3	2		1	83	3.50
P10	1964	16	5	4		7	53	2.18
P12	1964	10	5			5	50	2.50
P13a[1]	1964	1				1	0	0
P14[1]	1965	4				4	0	0
P16[1]	1965	1				1	0	0
P17	1965	1	1			0	100	5.00
P18	1965	2				2	0	0
P19	1965	4				4	0	0
P20c	1965	5				5	0	0
P20x	1965	14	2	2	1	9	36	1.21
P21c	1965	17	3			14	17	0.88
P21x	1965	15	2			13	18	0.67
P21a	1965	15			1	14	7	0.07
P22c	1965	3				3	0	0
P22x	1965	6				6	0	0
P27c	1965	3				3	0	0
P27x	1965	8	1	1		6	25	1.00
P27a	1966	3				3	0	0
P29a	1966	3			1	2	33	0.33
		Progeny Lots at Tillages						
P30c	1966	19				19	0	0
P30X	1966	36				36	0	0
P31c	1966	14				14	0	0
P31X	1966	7				7	0	0
P32c	1966	6				6	0	0
P32a	1966	13				13	0	0
P32 #3	1966	1				1	0	0
P32 #5	1966	1				1	0	0
P32X	1966	7				7	0	0
P33c[1]	1966	35	1			34	3	0.14
P33X	1966	2				2	0	0
P34c	1966	4				4	0	0
P35c	1966	7				7	0	0
P35X	1966	19				19	0	0
P37a	1967	1				1	0	0
P37X	1967	1				1	0	0

[1] at VIMS Pier

Location or Tray No.	Date imported	No. of gapers tested	No. Infections by intensities H	M	L	N	Percent infected	Weighted Incidence
P38	1967	2				2	0	0
P39[1]	1967	4				4	0	0
P40c	1967	7				7	0	0
P42c	1967	5				5	0	0
P44c	1967	9				9	0	0
P48c[1]	1967	2			1	1	50	0.50
P49	1966	2				2	0	0
P50	1967	4				4	0	0
P52	1967	1				1	0	0
P53	1967	4				4	0	0
		Mobjack Bay						
MJ6*	Oct 65	5				5	0	0
MJ16	Mar 67	30				30	0	0
MJ17	Apr 67	21				21	0	0
MJ18	Mar 68	23				23	0	0
MJ19	Apr 68	13				13	0	0
		Rappahannock River						
R14	Jul 68	5				5	0	0

[1] at VIMS Pier

SUMMARY OF INFORMATION ABOUT DERMOCYSTIDIUM THAT RELATES TO CLAIMS OF NEW EPIZOOTIC IN MARYLAND

J. D. Andrews

4 May 1977

The distribution of Dermocystidium in 1954 was essentially the same as found in 1976 (Andrews and Hewatt, 1957; Otto data, 1976). Limited sampling in 1954 showed Dermo to be in the lower Potomac, lower Patuxent, Tangier Sound, Pocomoke Sound and all areas lower in Chesapeake Bay. The area of concern in Maryland now is the Fishing Bay - Nanticoke River beds just above Tangier Sound. Only one sample was taken in this area in 1954 and it was negative. Dermo may have spread into this area in the past 20 years. The highest location in the Bay where Dermo was found in 1976 was Little Choptank River with 3 light cases in 25 oysters (Otto, 1976). However, established infections were found in the Patuxent River in 1954 which has lower salinities than the Fishing Bay - Pocomoke Sound area of bays above the Md-Va line. The planting of seed oysters in these bays has probably augmented Dermo activity in the 1960's and 1970's.

The weather is an important factor in Dermo activity in terms of salinities and temperatures. Dermo is a warm-season disease that is limited in its effects in Chesapeake Bay by the arrival of cooler fall weather. Prolonged warm falls such as occurred in 1974 and 1975 provide extra time

for Dermo to kill oysters and spread. Prevalences become high, often 100%, and the chances for increased over-wintering cases are improved. This leads to early Dermo cases in June of the next year; these die and initiate an early round of disease the second-summer which may then allow enough time for a third round of deaths. The peak of deaths is in August and September but a warm October may continue the endemic kills. Usually temperatures stop deaths by 1 November except for straggling advanced cases. By late December when dormancy of oysters occurs, most cases of Dermo have been expulsed or are not detectable by thioglycollate technique. If infections are not eliminated by winter dormancy, they will persist until April when oysters discharge them at temperatures of 15°C and lower. In April and May, oysters do not usually exhibit clinical Dermo and such cases as occur are usually very light. No appreciable deaths from Dermo occur between 1 November and 1 June of the succeeding year. There is little value in making tests during that period for prevalences or distribution.

Salinity per se is not a good controlling agent for Dermo. It is commonly used as a convenient handle to describe areas where Dermo becomes established and kills oysters. Dermo is usually confined to areas with late summer salinities of 12 to 15 o/oo at least. These areas may have much lower salinities in winter and spring without eliminating the pathogen. Dermo does not respond quickly to seasonal salinity changes but it persists until conditions (temperature and salinity) are right for multiplication and infection. Temperature is a much more restrictive factor than salinity and probably is the major factor in eventual eradication.

Over the long term, low salinity tends to limit and eradicate Dermo because reproduction is slowed, few oysters die and new infections do not occur. Overwintering in low salinities is probably limited because the balance of environmental factors favors the oyster. Mackin states that in the Gulf of Mexico, Dermo will live almost anywhere that oysters do. However, wide seasonal fluctuations of salinities there may mislead interpretations with the pathogen simply holding on until higher salinities occur. One must look at salinity regimes over all seasons before concluding that an area is unfavorable to Dermo.

Much emphasis is being given in Maryland to purported occurrence of Dermo in salinities lower than 12 to 15 o/oo. There is speculation that a new strain adapted to low salinities has evolved. Yet, not only are current endemics of Dermo within the distributional range given in 1957 (Andrews and Hewatt) but also within the usual salinity limits given as 12 o/oo to 15 o/oo during the critical summer and fall seasons. The Atlas of Salinity and Temperature Distributions by Stroup and Lynn (1963) for Chesapeake Bay gives seasonal averages from 24 cruises between 1949 and 1961. The summer surface salinity average of 14 o/oo isohaline runs from Smith Point at the mouth of the Potomac River to Hooper Islands at the mouth of the Honga River. In autumn the 17 o/oo isohaline runs essentially the same course. Fishing Bay, Nanticoke River, Manokin River, Tangier and Pocomoke Sounds are all

within these or higher salinity regimes. In spring, the low-salinity season, the 11 o/oo isohaline runs the same course as above. Surface salinities approximate shallow oyster bed values which are a little higher. Lower salinities occur up the tributaries where freshwater runoff occurs, although runoff is small in the warm season on Eastern Shore. Annual fluctuations occur too. Individual autumn cruises show salinities of 18 o/oo to 20 o/oo in the sounds. Lastly, the 1976 data collected by Otto show 15 o/oo for all stations in Fishing Bay where Dermo is severe now (no date, but fall) and 14.8% at Ragged Point in the Little Choptank River where 3 light infections were found in 1976 for the first time ever. Short-term fluctuations of salinities may occur but the regimes in late-summer and fall in Maryland seem to fit the arbitrary handle of 12 to 15 o/oo as the indicator of areas where Dermo may thrive.

Dermo does not spread to new areas suddenly and catastrophically. It spreads from oyster to oyster by water currents carrying the infective stages but infections beyond 50 to 100 feet are not common. The pathogen depends upon dense populations of oysters in close proximity through natural recruitment or seed planting. Public beds with recruitment and continuous populations are most difficult on which to control the disease. Private beds are harvested regularly about every two years. Thorough cleaning of beds, avoidance of diseased seed and early harvesting usually provide adequate control. Isolation from public beds and other beds

of old oysters is important to private planters. Eradication of Dermo is very difficult as long as live oysters are available to infection. Nearly every man-made pier or structure in the lower Chesapeake Bay is a repository for wild oyster setting and hence a source of Dermo infections. Areas of low tidal flushing, such as shallow warm coves, increase the risk of infections.

The James River seed area is usually rather free of Dermo because of high flushing rates, young oysters, and low salinities. Young oysters usually escape mortalities and have few infections as yearlings even under intensive exposure. However, even one gaper in a tray or among a patch of oysters on the bottom can start an epizootic which spreads rapidly in nearby oysters but slowly in distance. Oysters dying from Dermo are full of infective stages. From 10 to 1000 of these may be required to establish new infections hence dilution in tidal waters rapidly reduces the risk. The lower sector of the seed area had some Dermo infections in the fall of 1976 and this is where most seed oysters were harvested in the past two years. Brown Shoal bed is the worst area and nearly always has some Dermo. Most of these infections are light and are eliminated by oysters in fall and spring but the chance of importing some infected seed oysters exists.

The statement that Dermo is where the oysters are is self-evident but important. There are few oysters in the Virginia sector of the lower Bay because MSX continues to ravish them and no planting is being done. Public beds are denuded and deteriorating as substrates. Dermo is active primarily on the fringe areas of MSX activity where surviving oysters are fairly

abundant and recruitment occurs. In terms of oyster beds these areas are mostly where salinities fluctuate around the 15 o/oo isohaline. These are the lower James River seed area, the York River above Gloucester Point, the middle of the Rappahannock River near Urbanna, the lower Potomac River near the mouth and numerous bays and creeks on the lower Bay. Bayside of Eastern Shore Creeks up to and including Pocomoke Sound are Virginia localities of concern. The Fishing Bay - Nantiocke River cluster of bays in Maryland seem to be the most active area in Chesapeake Bay now due to planting of seed oysters by the State of Maryland (Otto, 1976). Dermo is not present on Seaside of Eastern Shore and does not persist long there when introduced.

Monitoring for Dermo activity would be quite easy except that there are so many oyster-growing bays and rivers in Virginia with varying oyster populations, histories of cultivation and differing environmental parameters. September and October, when endemics are in full course, are the best times to sample live oysters. Some infections will persist into December but from 1 January to 1 June any infections found are fortituous. Random samples of 25 oysters are usually tested, or if there are several age groups, the older oysters are more likely to have the disease. For most purposes a random sample gives the best information. Gapers or dying oysters can be tested but are difficult to find with meats still present. The thioglycollate test involves culturing bits of gill or mantle in a growth medium for about 3 days. Some old oysters appear to be resistant to Dermo but by the time this happens over 90% of the crop has died. Breeding survivors has not improved resistance appreciably.

PART II

Perkinsus marinus = *Dermocystidium marinum* ("Dermo") in Virginia, 1950 to 1980

by

Jay D. Andrews

PART II

Occurrence of *D. marinum* (Dermo) in Live Oysters in Virginia, 1952 to 1980

Presented as Annual Lists of Fluid Thioglycollate Tests in Chronological Order by River Areas

Data from Fluid Thioglycollate Tests of Live Oysters, 1952 to 1980

INDEX

Year	Page No.
1952	1
1953	2
1954	5
1955	9
1956	12
1957	15
1958	18
1959	21
1960	27
1961	31
1962	34
1963	37
1964	39
1965	43
1966	45
1967	48
1968	50
1969	52
1970	54
1971	56
1972	57
1973-76	58
1977	60
1978-79	62
1980	64

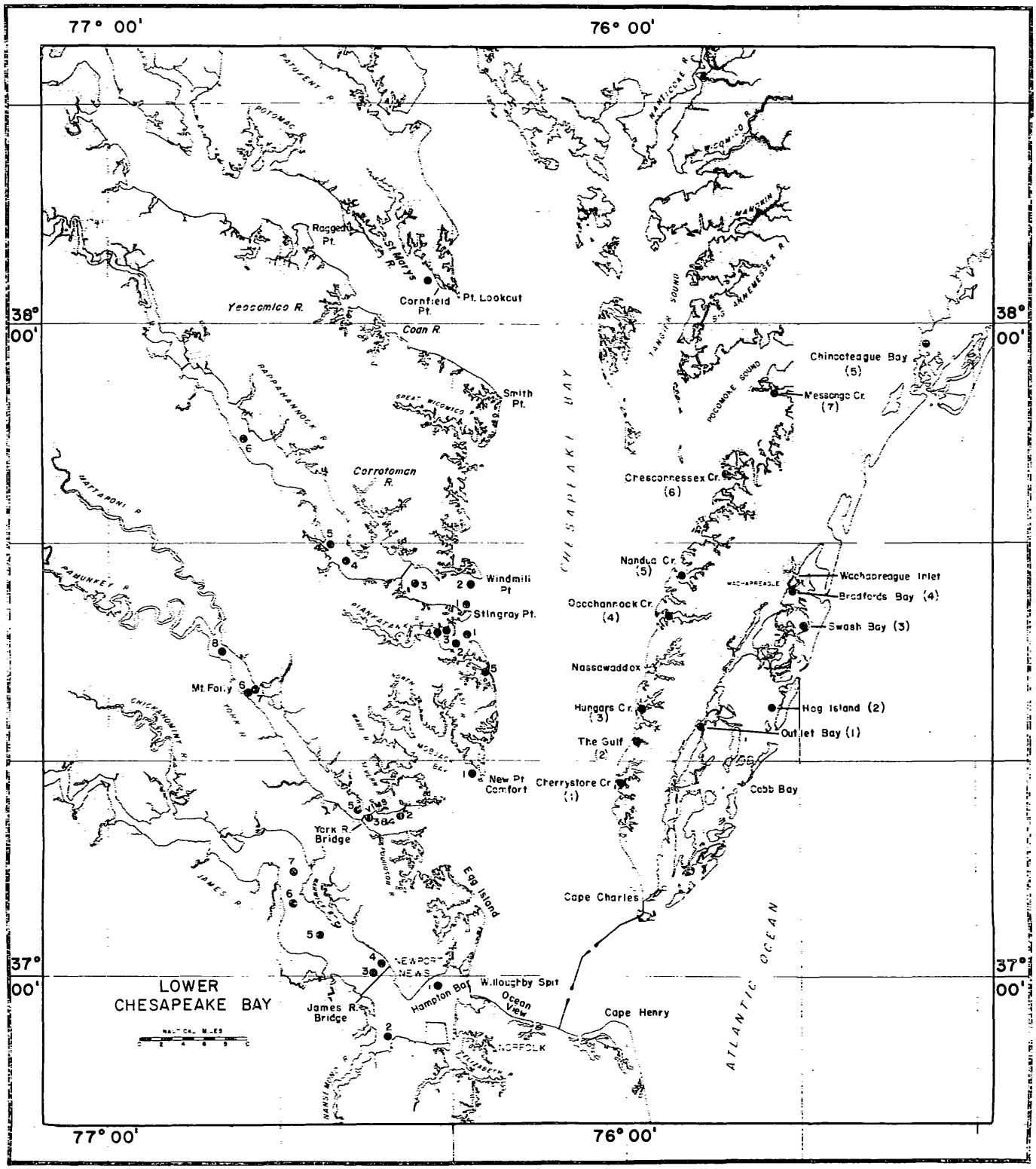

Figure 1. Map of stations monitored for D. marinum and MSX. Sampling stations for oysters taken from public and private beds, and trays of oysters to determine prevalences and mortalities of diseases in Lower Chesapeake Bay.

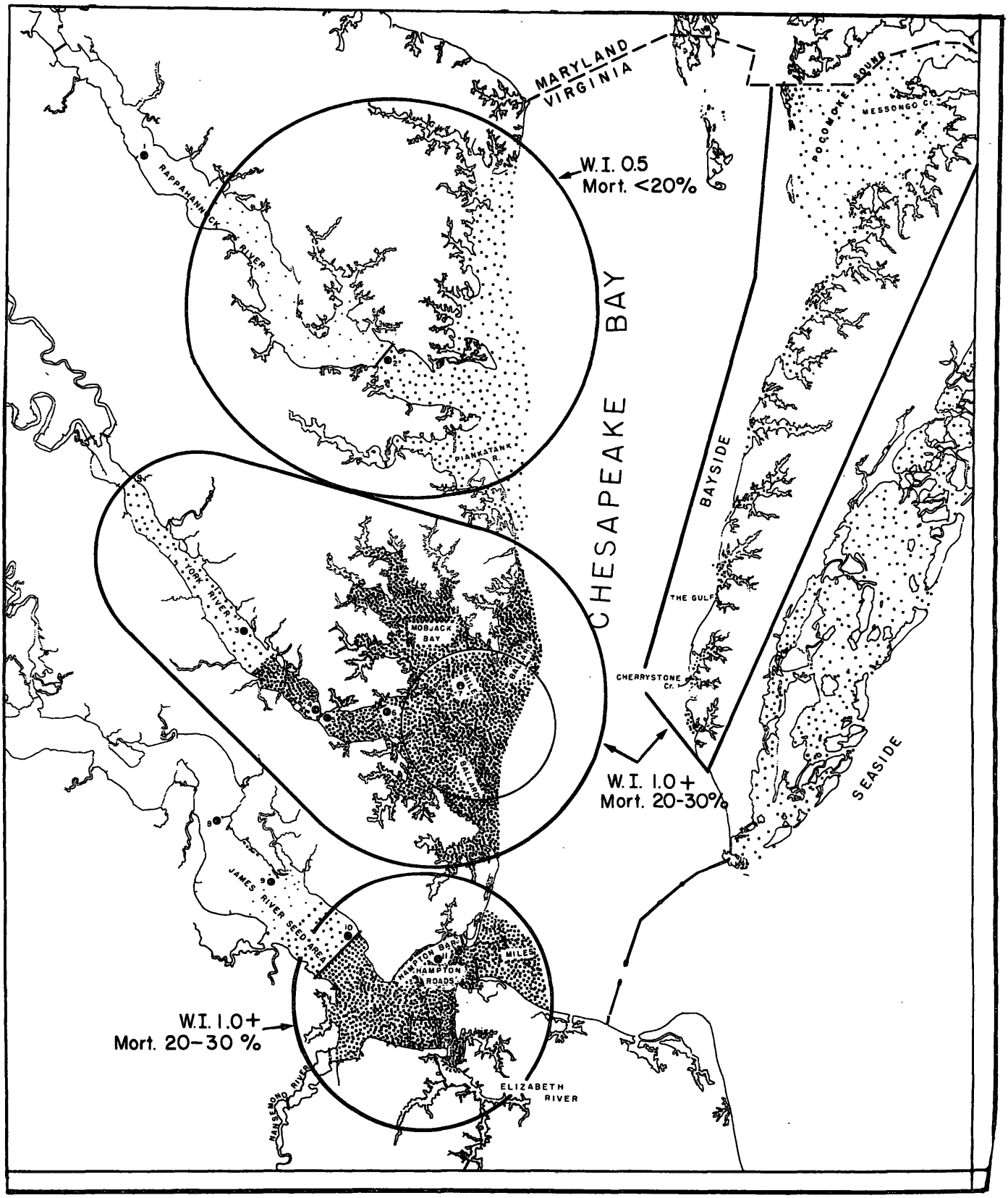

Figure 2. Weighted incidences of D. marinum and resulting mortalities in average years when normal populations of oysters are present--e.g. pre-MSX years. Dermo activity defined inside the heavy lines superimposed on MSX distribution and intensity, see Andrews and Wood, 1967, for stations.

Summary of Dermocystidium Tests on Live Oysters
1952

Date	Source	Size or Age	No. Tested	Weighted Incidence	Percentages H	M	L	N
21 Aug.	Hoghouse Bar	Market	50	.066	8.0	8.0	2.0	82.0
21 Aug.	Pages Rock	Old Mkt.	27	1.111	14.8	11.1	3.7	70.4
22 Aug	Ellen Island	Market	49	1.551	20.4	10.2	22.4	46.9
22 Aug	VFL Pier	Small	49		0.0	4.1	22.4	73.5
24 Aug	Severn River	Market	50		0.0	2.0	4.0	94.0
25 Aug	Ocean View	Market	50	1.120	6.0	20.0	22.0	52.0
25 Aug	Horn Harbor	Market	50	1.040	14.0	4.0	22.0	60.0
26 Aug	Wreck Shoal	Small	50		0.0	0.0	0.0	100.0
26 Aug	Deep Water Shoal	Small	23					100.0
17 Dec	Tray 11	16 mo.	40	.075		2.5		97.5

These sampling dates are too early to give full prevalences of Dermo in 1952 JOA

Occurrence of *Dermocystidium marinum* Live Oysters of Chesapeake Bay Area, 1953

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
James River							
Hampton Bar	20 Jan	51			10	90	0.10
	15 Jul	25	4	16	8	72	0.76
	23 Jul	25	4	20	12	64	0.92
	10 Aug	50		7	38	55	0.58
	27 Aug	50		12	36	52	0.72
	2 Oct	30		16	48	36	0.97
Brown Shoal	18 Aug	50		2	2	96	0.08
J. R. Buoy "6"	18 Aug	50			2	98	0.02
J. R. Buoy "8"	18 Aug	50		4	10	86	0.22
J. R. Buoy "10"	18 Aug	50			2	98	0.02
Wreck Shoal	30 Apr	25				100	0
	15 Jul	25				100	0
York River							
Gloucester Pt.	17 Aug	50	2	20	30	48	1.00
Ferry Pier, Gl. Pt.[1]	27 Aug	25		20	56	24	1.16
Ferry Pier, Gl. Pt.[2]	27 Aug	25		20	52	28	1.12
	6 Oct	40	5	8	35	52	0.82
VIMS yearlings	4 Sep	50				100	0
Felgates Cr.	16 Sep	25				100	0
Rappahannock River							
Hoghouse Bar	30 Apr	25			4	96	0.04
	7 May	26				100	0
	15 Jun	25			4	96	0.04
	16 Jun	20			5	95	0.05
	7 Jul	26		8		92	0.23
	7 Jul	26	4		8	92	0.27
	4 Aug	50	2	2	12	84	0.28
	31 Aug	50	2	2	20	76	0.36
	2 Oct	50	2	2	30	66	0.46
Morattico Bar	7 Aug	50			4	96	0.04

[1]intertidal oysters; [2]subtidal oysters

Chesapeake Bay Private Beds							
Egg Island	19 Aug	25	8	28	16	48	1.40
Wolf Trap	19 Aug	24		4	4	92	0.16
Seaside of Eastern Shore							
Willis Wharf	4 Aug	22				100	0
Chincoteague Bay	30 Jul	35				100	0
VIMS Pier Trays, Gloucester Pt.							
Tray No							
4	15 Apr	25				100	0
11	17 Apr	19				100	0
	28 Aug	37	5	11	19	65	0.78
15[3]	5 Sep	25	4	4	56	36	0.88
17	10 Jun	25				100	0
	1 Oct	25	4	8	16	72	0.60
18	4 Jul	25				100	0
19	3 Aug	25			8	92	0.08
20	31 Aug	25		4	12	84	0.24
21	14 Jul	25		12	4	84	0.40
23	4 Aug	25		16	40	44	0.88
24	31 Aug	25	4	16	60	20	1.28
23 & 24	30 Sep	25	4	20	52	24	1.32
Miscellaneous							
Venus mercenaria, VIMS							
	1 Sep	33			85	15	0.85
South Carolina yearlings, VIMS							
	4 Sep	50			10	90	0.10

[3]seaside yearlings at VIMS Pier

Occurrence of *Dermocystidium marinum* in Live Oysters of the Great Wicomico River, 1953

James Sisson

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Great Wicomico	2 Oct	25	20	12	28	40	1.64
	19 Nov	25	4	16	24	56	0.92
	8 Jan	25		4	24	72	0.36
	28 Feb	25			12	88	0.12

Occurrence of *Dermocystidium marinum* in Live Oysters in Chesapeake Bay in 1954

Tray No.	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
Trays at Virginia Fisheries Lab Pier, Gloucester Pt., Va., 1954							
4	4 Jan	17	0	6	41	53	0.76
4	31 Aug	24	0	4	29	67	0.42
5	27 Oct	12	0	42	58	0	1.83
11	31 Aug	25	8	24	64	4	1.76
15	27 Oct	17	0	47	47	6	1.88
17	29 Jan	25	0	4	8	88	0.20
"	2 Mar	25	0	0	0	100	0
"	30 Mar	25	0	0	0	100	0
"	1 May	25	0	0	0	100	0
18	1 Jun	25	0	4	12	84	0.24
"	1 Jul	25	8	20	12	60	1.12
"	30 Jul	25	0	12	56	32	0.92
"	27 Aug	25	16	28	44	12	2.08
20	5 Oct	25	12	48	36	4	2.40
"	29 Oct	25	4	28	60	8	1.64
"	30 Nov	20	5	5	60	30	1.00
21 & 22	31 May	25	0	4	28	68	0.40
21	2 Jul	25	4	16	20	60	0.88
"	30 Jul	25	0	24	40	36	1.12
"	28 Aug	25	24	24	44	8	2.36
"	1 Oct	18	6	39	50	6	1.94
22 & 23	29 Jan	25	0	4	24	72	0.36
"	3 Mar	25	0	4	4	92	0.16
"	31 Mar	25	0	0	4	96	0.04
"	3 May	25	0	0	16	84	0.16
33	5 Nov	25	4	32	40	24	1.56
37	5 Nov	25	0	32	44	24	1.40
38	7 Jun	25	0	0	0	100	0
"	23 Jul	25	0	0	4	96	0.04
"	28 Aug	25	0	0	20	80	0.20
"	6 Sep	25	0	0	16	84	0.16
"	27 Oct	25	0	0	4	96	0.04
39	31 May	25	0	0	0	100	0
"	23 Jul	25	0	4	12	84	0.24
"	28 Aug	25	0	0	8	92	0.08
"	8 Sep	25	0	4	48	48	0.60
"	27 Oct	25	8	16	28	40	1.26
40	12 Jun	25	0	0	0	100	0
"	23 Jul	25	0	0	4	96	0.04
"	28 Aug	25	0	0	24	76	0.24
"	24 Sep	25	0	8	12	80	0.52
"	29 Oct	25	4	8	12	76	0.56

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
		Ferry Pier, Gloucester Point, Va.					
Ferry Pier Natives	7 Jan	25	0	0	12	88	0.12
"	1 Feb	25	0	0	20	80	0.20
"	4 Mar	25	0	8	16	76	0.40
"	7 Apr	25	0	0	0	100	0
"	6 May	25	0	4	16	80	0.28
"	3 Jun	25	0	16	16	68	0.64
"	29 Jun	25	4	4	16	76	0.48
"	29 Jul	25	0	36	28	36	1.36
"	26 Aug	25	12	36	32	20	2.00
"	12 Oct	25	4	28	52	16	1.56
"	5 Nov	25	4	36	48	12	1.76
		James River Samples, 1954					
Ocean View	22 Aug	25	4	24	32	40	1.24
Ocean View (old)	26 Aug	25	0	12	56	32	0.92
Nansemond Ridge	11 Aug	25	0	32	22	44	1.20
" "	21 Sep	17	12	29	47	12	1.94
Darl. Gr. Hampton Bar	10 Dec	25	0	0	36	64	0.36
Hampton Bar, J.R.	6 Jan	40	0	3	32	65	0.40
"	8 Feb	40	0	3	15	82	0.22
"	8 Mar	40	0	0	3	97	0.03
"	3 Apr	40	0	0	0	100	0
"	11 May	40	0	0	0	100	0
"	3 Jun	40	0	0	28	72	0.28
"	1 Jul	40	3	5	20	72	0.48
"	29 Jul	40	8	12	8	72	0.82
"	27 Aug	40	13	22	20	45	1.50
"	13 Oct	25	4	32	52	12	1.68
"	2 Nov	25	0	28	40	32	1.24
		Rappahannock River Samples 1954					
Hoghouse, Rapp. R.	7 Jan	25	0	0	12	88	0.12
"	2 Feb	25	0	0	0	100	0
"	8 Mar	60	0	2	5	93	0.10
"	1 Apr	40	0	0	3	97	0.03
"	12 May	40	0	0	0	100	0
"	1 Jun	40	0	0	8	92	0.08
"	2 Jul	40	0	8	5	87	0.28
"	28 Jul	40	0	10	12	78	0.42
"	30 Aug	40	0	10	33	57	0.62
"	4 Oct	25	4	12	40	44	0.96
"	29 Oct	25	4	16	52	28	1.20

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
Eastern Shore of Virginia Samples, 1954							
Chincoteague Bay	31 May	25	0	0	0	100	0
" (Sieling)	6 Sep	25	0	0	0	100	0
Indian R., Del.	2 Sep	25	0	0	0	100	0
Toms Cove, Chinco.	2 Sep	25	0	0	4	96	0
Metompkin Bay	21 Sep	25	0	0	0	100	0
Hog Is. Bay	2 Sep	25	0	0	0	100	0
Buoy Rock, Pocomoke S.	2 Sep	20	0	5	15	80	0.24
Middle Gr., "	2 Sep	17	0	12	12	76	0.47
Messongo Cr.	2 Sep	25	4	0	76	20	1.16
Pungoteague Cr.	2 Sep	25	4	8	68	20	1.12
Cherrystone Cr.	2 Sep	25	0	24	32	44	1.04
Chincoteague Bay	9 Nov	20	0	0	0	100	0
Potomac River Samples, 1954 (old)							
Billys Pt., Potomac R.	11 Sep	25	0	0	0	100	0
Ragged Pt., "	10 Sep	25	0	0	16	84	0.16
Yeocomico R.	11 Sep	25	0	0	84	16	0.84
Coan R.	10 Sep	25	0	0	12	88	0.12
No. 2 "inside"	25 Sep	20	0	20	15	65	0.75
No. 4 "outside"	25 Sep	20	0	0	0	100	0
Slaughters Bed, G. Wic.	7 Oct	20	10	20	55	15	1.65
Fleets Pt. Beacon, G. Wic.	7 Oct	20	0	5	40	55	0.55
Lancaster Cr.	21 Aug	16	0	6	0	94	0.19
Maryland Sector of Chesapeake Bay - Public Beds							
Solomons Is. (?)	7 Oct	25	0	40	44	16	1.64
Cinder Hill, Hol. Straits	18 Oct	25	0	0	4	96	0.04
Punch Is. Cr., Cove Pt.	28 Oct	20	0	0	0	100	0
Cedar Pt. Hol., Pt.No.Pt.	28 Oct	20	0	20	45	35	1.04
Great Rock, Tangier S.	8 Nov	19	0	0	0	100	0
Lit. Egg Is. Bar, Tang. S.	8 Nov	20	0	25	35	40	1.10
Popular Is., Eastern Bay	8 Nov	20	0	0	0	100	0
Love Pt., Kent Is.	8 Nov	20	0	0	0	100	0
Sharkfin Shoal, Tangier S.	8 Nov	20	0	0	0	100	0
Parkers, S end Anne Arundel	8 Nov	20	0	0	0	100	0

Tests for *Dermocystidium marinum* in Live Oysters From Maryland Public Beds, 1954

J. D. Andrews and Dexter S. Haven

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Great Rock, Tangier Island	8 Nov	19				100	0
Little Egg Island Bar	?	?		25	35	40	1.10
Cinder Hill, Holland Straits	14 Oct	25			4	96	0.04
Sharkfin Shoal	4 Nov	20				100	0
Pembroke in Cedar Pt. Hollow, Pt. No. Pt.	25 Oct	20		20	45	35	1.04
Solomons Island	7 Oct	25		40	44	16	1.64
Punch Island Creek Bar, Cove Pt.	25 Oct	20				100	0
Poplar Island	28 Oct	20				100	0
Parkers Bar	26 Oct	20				100	0
Love Point	27 Oct	20				100	0

Occurrence of *Dermocystidium marinum* in Live Oysters in Chesapeake Bay, 1955

Tray No.	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
Trays at VIMS Pier, 1955							
4 (S.C.)	10 Sep	25	4	16	20	60	0.88
11	10 Sep	25	4	36	56	4	1.84
20	3 Feb	18	0	11	17	72	0.50
26	17 Nov	25	0	20	72	8	1.32
33	17 Nov	25	0	20	60	20	1.20
37	17 Nov	25	0	24	64	12	1.36
38 (S.C.)	14 Feb	25	0	0	0	100	0
" "	25 Oct	25	4	0	36	60	0.56
39	11 Feb	25	0	0	0	100	0
"	25 Oct	25	0	16	52	32	1.00
40	25 Oct	25	0	8	64	28	0.88
James River Seed Area							
Location of Oysters							
Brown Shoal	15 Aug	25	0	0	12	88	0.12
Gun Shoal	23 Aug	25	0	0	0	100	0
White Shoal	22 Aug	25	0	0	0	100	0
Wreck Shoal	22 Aug	25	0	0	0	100	0
Deep Water Shoal	6 Jul	20	0	0	0	100	0
Hampton Roads, James River, 1955							
Hampton Bar	10 Feb	25	0	0	24	76	0.24
"	9 Mar	25	0	0	8	92	0.08
"	2 Apr	25	0	0	0	100	0
"	27 Apr	25	0	0	0	100	0
"	1 Jun	25	0	0	4	96	0.04
"	30 Jun	25	8	4	20	68	0.72
"	27 Jul	25	8	12	28	52	0.84
"	1 Sep*	25	0	0	24	76	0.24?
"	28 Sep	25	0	24	48	28	1.20
"	1 Nov	25	0	28	52	20	1.36
"	2 Dec	25	0	8	64	28	0.88
Nansemond Ridge (Hazelwood Gr.)	26 Sep	25	0	24	44	32	1.16
" "	27 Sep	25	0	16	28	56	0.76

* Sample not typical

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
		York River Samples					
Ferry Pier Pilings	14 Jan	25	0	4	36	60	0.48
"	3 Feb	25	0	4	16	80	0.28
"	2 Mar	25	0	0	8	92	0.08
"	1 Apr	25	0	0	0	100	0
Tillage Gr.	28 Apr	25	0	4	0	96	0.12
"	2 Jun	25	0	0	24	76	0.24
"	29 Jun	25	0	20	32	48	0.92
"	26 Jul	25	0	32	32	36	1.28
"	29 Aug	25	4	24	44	28	1.36
"	26 Sep	25	4	32	40	24	1.56
"	28 Oct	25	0	20	72	8	1.32
"	1 Dec	25	8	12	48	32	1.12
Pages Rock	19 Aug	25	8	4	8	80	0.60
Claybank (Blake)	29 Aug	25	0	12	16	72	0.52
" (Leigh)	19 Aug	25	0	8	48	44	0.72
Fox Cr. (Williams)	19 Aug	25	4	28	52	16	1.56
Poropotank Cr.	6 Sep	25	0	0	36	64	0.36
Bell Rock	19 Aug	25	4	8	44	44	0.88
"	29 Aug	20	0	0	30	70	0.30
"	6 Sep	25	0	28	40	32	1.24
		Rappahannock River Area, 1955					
Hoghouse	17 Jan	25	0	0	8	92	0.08
"	1 Mar	25	0	0	0	100	0
"	29 Mar	25	0	0	4	96	0.04
"	28 Apr	25	0	0	0	100	0
"	2 Jun	25	0	0	0	100	0
"	30 Jun	25	0	8	4	88	0.24
"	27 Jul	25	0	4	12	84	0.24
"	26 Aug	25	8	20	52	20	1.52
"	23 Sep	25	0	0	52	48	0.52
"	31 Oct	25	0	8	48	44	0.72
"	1 Dec	25	0	4	40	56	0.52
Smoky Point	30 Aug	10	0	10	30	60	0.60
Piney Island	30 Aug	10	10	30	10	50	1.50
Morattico Bar	30 Aug	10	0	0	60	40	0.60
Bowlers Rock	26 Aug	25	0	0	0	100	0
Bowlers Rock	26 Aug	25	0	0	0	100	0
		Potomac River Area, 1955					
Machodoc Cr.	1 Sep	13	0	0	0	100	0
Dawsons Gr.	1 Sep	12	0	0	0	100	0
Nomini Bay	4 Sep	20	0	0	0	100	0

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Bayside of Eastern Shore, Va., 1955							
The Gulf	26 Sep	25	0	0	16	84	0.16
"	26 Sep	25	0	32	32	36	1.28
Hungars Cr.	15 Oct	25+1	0	11.53	53.8	34.6	0.90
Pungoteague Cr.	17 Oct	25	0	12	56	32	0.92
Occohannock Cr.	15 Oct	17	0	5.9	64.7	29.4	0.82
"	17 Oct	25	4	12	44	40	1.00
Nandua Cr.	17 Oct	25	0	24	28	48	1.00
Chesconessex Cr.	17 Oct	25	4.1	0	16.7	75	0.62
Messongo Cr.	28 Sep	25	0	32	56	12	1.52
Pocomoke Sound	26 Sep	25	0	21	37	42	1.00
Seaside of Eastern Shore, Va., 1955							
Willis Wharf	29 Aug	10	0	0	0	100	0
Layton's Ridge	29 Aug	4	0	0	0	100	0
Hog Island Bay	15 Oct	25	0	0	0	100	0
Watts Bay	28 Sep	25	0	0	0	100	0
Chincoteague Bay	28 Sep	21	0	0	0	100	0
Chincoteague Bay	15 Oct	24	0	4	0	96	0.12

Thioglycollate Tests for Occurrence of *Dermocystidium marinum* in Live Oysters from the Chesapeake Bay Area, 1956

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
James River Seed Area							
Brown Shoal	22 Sep	25	4	4	8	84	0.40
Wreck Shoal	22 Sep	25	0	0	4	96	0.04
Darlings Watchhouse	3 Jan	25	0	8	12	80	0.36
" "	1 Feb	25	0	0	16	84	0.16
" "	1 Mar	25	0	0	4	96	0.04
" "	2 Apr	25	0	0	0	100	0
" "	1 May	25	0	0	0	100	0
" "	1 Jun	25	0	0	0	100	0
Hampton Roads							
Darlings Watchhouse	5 Jul	25	0	4	20	76	0.32
" "	2 Aug	25	0	4	20	76	0.32
" "	5 Sep	25	0	20	16	64	0.76
" "	1 Oct	25	0	16	24	60	0.72
" "	31 Oct	25	0	8	32	60	0.56
" "	3 Dec	25	4	16	12	68	0.80
Hazelwood H.R.42	18 Oct	25	8	16	20	56	1.08
" C.I.1	18 Oct	25	0	4	8	88	0.20
" M.&R.	18 Oct	25	0	0	0	100	0
Bagnell Gr.	24 Oct	25	4	20	64	12	1.44
York River							
Tillage (Gl. Pt.)	2 Jan	25	0	0	48	52	0.48
"	9 Jan	25	0	0	16	84	0.16
"	2 Feb	25	0	12	8	80	0.44
"	2 Mar	25	0	0	4	96	0.04
"	2 Apr	25	0	0	0	100	0
"	2 May	25	0	0	0	100	0
"	31 May	25	0	0	0	100	0
"	2 Jul	25	0	4	4	92	0.16
"	31 Jul	25	0	4	12	84	0.24
"	5 Sep	25	0	24	44	32	1.16
"	2 Oct	25	4	24	32	40	1.24
"	29 Oct	25	4	4	32	60	0.64
"	3 Dec	25	0	12	40	48	0.76

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Rappahannock River							
Hoghouse Bar	2 Jan	25	0	0	16	84	0.16
"	2 Feb	25	0	4	4	92	0.16
"	29 Feb	25	0	0	4	96	0.04
"	3 Apr	25	0	0	0	100	0
"	30 Apr	25	0	0	0	100	0
"	31 May	25	0	0	0	100	0
"	2 Jul	25	0	0	12	88	0.12
"	27 Jul	25	0	4	8	88	0.20
"	30 Aug	25	4	16	12	68	0.80
"	2 Oct	25	0	12	16	72	0.52
"	31 Oct	25	0	8	28	64	0.52
"	28 Nov	25	0	8	20	72	0.44
Parrott's Rock	30 Nov	25	0	8	16	76	0.40
Drummond Gr.	30 Nov	25	0	12	16	72	0.52
Smoky Point	30 Nov	25	0	4	28	68	0.40
Morattico	30 Nov	25	0	8	8	84	0.32
Potomac River							
Coan River	31 Oct	25	0	0	4	96	0.04
Yeocomico River	31 Oct	25	0	0	0	100	0
Ragged Point	31 Oct	25	0	0	0	100	0
Bayside of Eastern Shore							
Cherrystone Creek	15 Oct	25	0	8	20	72	0.44
The Gulf	16 Oct	25	0	4	20	76	0.32
Hungar's Creek	16 Oct	25	0	19	31	50	0.88
Occohannock Creek	15 Oct	25	0	4	12	84	0.24
Messongo Creek	15 Oct	25	0	8	20	72	0.44
Radar Sta. off Gulf	10 Oct	25	0	0	0	100	0
Pocomoke Sound							
Middle Ground	17 Oct	25	0	8	0	92	0.24
Buoy Rock	15 Oct	25	0	0	0	100	0
Seaside of Eastern Shore							
Hog Island Bay	16 Oct	25	0	0	0	100	0
"	16 Oct	25	0	0	0	100	0
Tom's Cove	15 Oct	25	0	0	0	100	0
Chincoteague Bay	15 Oct	25	0	0	0	100	0

Tray No.	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Tray Oysters at Gloucester Point, VIMS Pier							
26	17 Sep	25	4	32	36	28	1.52
38	18 Sep	25	4	12	32	52	0.88
39	19 Sep	25	4	40	48	8	1.88
40	18 Sep	25	0	20	40	40	1.00
74	19 Sep	25	0	0	12	88	0.12
"	5 Oct	25	0	0	0	100	0
Location of Oysters							
York River Natives	18 Sep	25	0	20	40	40	1.00
Tray 80 (S.C.)	18 Sep	25	4	12	32	52	0.88
" "	25 Sep	25	0	8	12	80	0.36
Seaside of Eastern S.	19 Sep	25	4	40	48	8	1.88

Occurrence of *Dermocystidium marinum* in Live Oysters
In the Chesapeake Bay Area, 1957

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Brown Shoal	25 Sep	25	0	4	20	76	0.32
Gun Rock	25 Sep	25	0	4	4	92	0.16
Wreck Shoal	26 Sep	25	0	0	0	100	0
Rappahannock River							
Broad Creek	5 Dec	25	0	0	0	100	0
Morattico Bar	5 Dec	25	0	0	8	92	0.24
York River							
Jordan's Gr. (Gl.Pt.)	2 Sep	25	4	16	28	52	0.96
Western Shore, Chesapeake Bay, Virginia							
Miles Grounds	17 Dec	25	0	4	12	84	0.24
Mobjack Bay	21 Aug	25	8	0	4	88	0.44
Egg Island	21 Aug	25	0	20	24	56	0.84
"	21 Aug	25	0	16	24	60	0.72
"	17 Dec	25	0	4	16	80	0.28
"	17 Dec	25	0	16	24	60	0.72
Horn Harbor	21 Aug	25	0	0	4	96	0.04
Eastern Shore, Chesapeake Bay, Virginia							
Cherry Stone Cr.	11 Oct	25	0	4	40	56	0.52
The Gulf (Acuff)	11 Oct	25	0	20	68	12	1.28
Upper Hungar Cr.	11 Oct	25	4	8	36	52	0.80
Onancock Cr.	11 Oct	25	0	4	20	76	0.32
Messongo Cr.	11 Oct	25	0	28	40	32	1.24
Pocomoke S.(Old Rock)	10 Oct	25	0	0	0	100	0
" Mud Marsh Rock	11 Oct	25	0	0	0	100	0
Hog Island Bay	11 Oct	25	0	0	0	100	0
White Point	10 Oct	25	0	0	0	100	0
Tom's Cove	10 Oct	25	0	0	0	100	0
Chincoteague Bay	10 Oct	25	4	0	12	84	0.32

Occurrence of *D. marinum* in Live Oysters from Three Rivers in Virginia

Monthly Samples from Hoghouse Bar, Tillages Ground and Hampton Bar, 1957

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
		Rappahannock River					
Hoghouse Bar Natives	3 Jan	25	4	4	8	84	0.40
	31 Jan	25		4	4	92	0.16
	28 Feb	25				100	0
	27 Mar	25			4	96	0.04
	29 Apr	25				100	0
	30 May	25				100	0
	1 Jul	25		8	12	80	0.36
	2 Aug	25		16	4	80	0.52
	27 Aug	25		8		92	0.24
	2 Oct	25		12	24	64	0.60
	4 Nov	25		4	20	76	0.32
	5 Dec	25		4	20	76	0.32
	31 Dec	25				100	0
		York River					
Tillages Gr. Natives	9 Jan	25			16	84	0.16
	2 Feb	25			16	84	0.16
	28 Feb	25			8	92	0.08
	27 Mar	25				100	0
	1 May	25				100	0
	3 Jun	25		4	8	88	0.20
	27 Jun	25		4	12	84	0.24
	2 Aug	25		24	24	52	0.96
	29 Aug	25	4	44	20	32	1.68
	30 Sep	25	4	16	44	36	1.12
	29 Oct	25	4	20	52	24	1.36
	27 Nov	25		20	24	56	0.84
	31 Dec	25			20	80	0.20
		James River					
Hampton Bar Natives	4 Jan	26		4		96	0.12
	2 Feb	25		4		96	0.12
	2 Mar	25				100	0
	29 Mar	25				100	0
	1 May	25				100	0
	1 Jun	25		4	4	92	0.15
	1 Jul	25	4	8	4	84	0.48
	30 Jul	25		8	20	72	0.44

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
		James River (cont'd)					
Hampton Bar Natives	29 Aug	25		4	8	88	0.20
	30 Sep	25	12	8	32	48	1.16
	4 Nov	25	4		28	68	0.48
	27 Nov	25		20	12	68	0.72
	31 Dec	25			8	92	0.08
		VIMS Pier					
Tray No.							
10	6 Nov	25		8	33	59	0.55
11	6 Nov	25		20	32	48	0.92
25	6 Nov	25		30	35	35	1.26
26	11 Nov	25		20	40	40	1.00
33	8 Nov	25		14	43	43	0.86
37	8 Nov	25	2	21	35	42	1.09
38	7 Nov	25		12	24	64	0.60
39	6 Nov	25	4	21	46	29	1.29
40	7 Nov	25		8	40	52	0.64
56A	25 Oct	25		12	52	36	0.88
56B	17 Oct	25		12	36	52	0.73
67	17 Oct	25				100	0
74	6 Sep	25	12	28	20	40	1.64
	8 Nov	25	8	28	44	20	1.68
80	12 Nov	25			4	96	0.04
	7 Sep	25		4	16	80	0.28
81	7 Sep	25	16	28	32	24	1.95
	12 Nov	25		12	56	32	0.92
82	2 Oct	25	8	36	52	4	2.00
83	4 Oct	25	5	40	50	5	1.96
84-87-88	13 Sep	25	4	8	4	84	0.48
85	2 Oct	25	4	21	33	42	1.17
89	4 Oct	25	12	32	44	12	2.00
89 (stake)	19 Sep	25	4	32	28	36	1.44
90	4 Oct	25	13	12	54	21	1.54
90 (stake)	19 Sep	25	4	32	24	40	1.40

Occurrence of *Dermocystidium marinum* in Live Oysters of the Chesapeake Area, 1958

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
James River							
Hampton Roads	28 Jul	25			4	96	0.04
	25 Aug	25		8	8	84	0.32
Western Shore of Chesapeake Bay							
Ocean View (Miles)	13 Sep	25		8	8	84	0.34
Egg Island(Plot 2&3)	9 Sep	25		4	8	88	0.20
York River							
Tue Point	13 Sep	25		12	16	72	0.52
Tillage's Ground	5 Jun	25				100	0
	30 Jun	25		4		96	0.12
	14 Jul	25		12	8	80	0.44
	18 Jul	25		12	20	68	0.56
	14 Aug	25		24	16	60	0.88
	27 Aug	25		4	28	68	0.40
Tray	26 Sep	25				100	0
	26 Sep	25		12	4	84	0.40
	8 Oct	25	4	16	12	68	0.80
	30 Oct	25		20	10	70	0.56
	10 Dec	25		12	12	74	0.40
Pages Rock	10 Sep	25		16	24	60	0.72
	16 Dec	25		16	28	56	0.72
Purton Bay Tray	29 Sep	25				100	0
Bottom	27 Sep	25		4	4	92	0.16
Mobjack Bay							
Dryers Creek	31 Oct	25		20	44	36	1.04
Piankatank River							
Island Bar	10 Sep	25	4	24	28	44	1.20
Rappahannock River							
Broad Creek	9 Dec	25			16	84	0.16
Drummond Ground	13 Dec	24			13	87	0.12
Urbanna Tray	27 Sep	25				100	0
Urbanna Bottom	27 Sep	24		8	4	88	0.29

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
		Rappahannock River (continued)					
Smokey Point	13 Dec	25				100	0
Morattico Bar	9 Dec	24				100	0
Garretts Bottom	27 Sep	25				100	0
Garretts Tray	29 Sep	25				100	0
		Eastern Shore					
Bayside							
Mouth of Kings Creek (Cape Charles)	17 Jul	25		20	4	76	0.64
Cherrystone Creek	24 Nov	25				100	0
Acuffs, The Gulf	1 Nov	25		4	4	92	0.16
Hungars Creek	26 Nov	25		8	12	80	0.36
Lower Hungars Creek	24 Nov	25			20	80	0.20
Messongo	26 Nov	25			20	80	0.20
Tangier Island	22 Sep	25		4	12	84	0.24
Seaside							
Terrys Oysters	30 Oct	25				100	0
Toms Cove	26 Nov	25				100	0
Chincoteague Bay	25 Nov	25		4	16	80	0.28
Little Taylors Entrance	25 Nov	25				100	0
Seaside (?)	25 Nov	24				100	0
Pocomoke Sound	24 Nov	25		8		92	0.24
Drewer's Beds	25 Nov	25			20	80	0.20

Occurrence of Dermocystidium marinum in Live Oysters of the Chesapeake Area, 1958

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Tray 90	31 Oct	25		16	48	36	0.96
Tillages Ground	31 Oct	25		20	16	64	0.76
" , Down River	31 Oct	25		32	32	36	1.28
" , Red Painted	31 Oct	25		24	24	52	0.96
VFL Pier-Shellstring	23 Sep	25	4	4	20	72	0.52
Hoghouse Bar	13 Jun	25				100	0
	1 Jul	25				100	0
	29 Jul	25			8	92	0.08
	2 Sep	25			4	96	0.04
	24 Sep	25		4	4	92	0.16
	29 Oct	25		8	12	80	0.36
	2 Dec	25		4		96	0.12
VIMS Pier, 1958							
Tray No.							
74	21 Oct	25	4	16	40	40	1.08
75	22 Oct	25	8	21	54	17	1.52
76	22 Oct	25		25	54	21	1.29
80	21 Oct	25		17	17	66	0.67
81	22 Oct	25	4	16	40	40	1.08
94	3 Oct	25			4	96	0.04
96	23 Oct	25	8	8	28	56	1.00
97	23 Oct	25		8	16	76	0.40
99A	22 Oct	25	8	24	28	40	1.40
Location of Oysters							
VFL Pier	23 Sep	25	4	4	20	72	0.52
" " (Acuff spat)	22 Oct	25	8	8	36	48	1.00

Occurrence of *Dermocystidium marinum* in Live Oysters
of the Chesapeake Area, 1959
(25 oysters per sample)

Location	Date	Intensities of Infection by Percentages H	M	L	N	Weighted Incidence
James River						
Brown Shoal	13 Oct	4	16	24	56	0.92
Wreck Shoal	1 Sep				100	0
Wreck Shoal (edge)	13 Oct		4	4	92	0.16
Nansemond River	3 Dec	4	4	36	56	0.68
	7 Dec		16	36	48	0.84
Chuckatuck Creek	7 Dec		4	12	84	0.24
Pagan River	11 Nov	4	8	64	24	1.08
Hampton Bar						
Plot 6	23 Sep	4	12	36	48	0.92
James R. Plants (acclimated)	23 May				100	0
	29 Jun	4	4	12	80	0.44
	27 Jul		4	4	92	0.16
	19 Aug	12	12	4	72	1.00
	29 Oct	8	8	20	64	0.84
	17 Dec		4	20	76	0.32
Tray J4	28 Aug	4	20	40	28	1.20
James R. Plants (Jun '59)	19 Aug	4	4	8	84	0.40
Tray J5	28 Aug	4		8	88	0.28
York River						
Off Ellen Island						
Natives on bottom	28 Oct		32	44	24	1.40
James River Seed						
Tray Y7 (Mar)	16 Oct	16	36	44	4	2.32
Tray Y6 (Mar)	16 Oct	4	40	48	8	1.84
Rowe's Plants	10 Sep	4	16	32	48	1.00
Gloucester Point (Tillage, above bridge)						
James River Plants (acclimated)	8 Jun				100	0
	1 Jul		8	8	84	0.32
	7 Aug		12	16	72	0.52
	1 Sep	8	8	24	60	0.88
On Bottom	19 Oct	8	12	24	56	1.00
Tray Y5 (Mar)	19 Oct		16	16	68	0.64
Tray Y4 (Jul)	19 Oct		16	12	72	0.60
Tray Y3 (Mar)	19 Oct		20	16	64	0.76

Location	Date	Intensities of Infection by Percentages H	M	L	N	Weighted Incidence
Trays at VIMS Pier						
Tray No.						
75	29 Sep	24	36	36	4	2.64
91	1 Oct	16	32	20	32	1.96
96	13 Nov	4	20	28	48	1.08
97	17 Nov	12	28	40	20	1.84
98	17 Oct		8	24	68	0.48
102	10 Nov	4		16	80	0.36
Above Folly Point						
James River Oysters						
Tray Y1 (May)	24 Sep				100	0
Seaside Oysters						
Tray Y2 (May)	24 Sep				100	0
Mobjack Bay						
Location of Oysters						
Plot 4	20 Aug	8	8	12	72	0.76
10-12	20 Aug		12		88	0.36
18	20 Aug		16	16	68	0.64
64, 65, & 68	20 Aug		4	4	92	0.16
130	20 Aug	8	20	52	20	1.52
?	20 Aug		4		96	0.12
8	15 Sep	4	4	16	76	0.48
10	15 Sep	8	4	20	68	0.72
12	15 Sep	4	4	18	74	0.48
14, 15, & 16	15 Sep	4	4	20	72	0.52
17	15 Sep	4	16	36	44	1.04
18	15 Sep	4	16	24	56	0.92
65 & 66	15 Sep		8	12	80	0.36
109	15 Sep		4	8	88	0.20
142	15 Sep		5	11	84	0.20
El. H. Machen	21 Sep	8	4	24	64	0.76
Severn R.	15 Oct		16	44	40	0.92
Rappahannock River						
Butlers Hole	3 Dec			4	96	0.04
Towles Pt. (Morgan)	20 Aug	4	20	56	20	1.36
Hoghouse Bar Natives	6 Jul				100	0
	26 Aug		4	8	88	0.20

Location	Date	Intensities of Infection by Percentages H	M	L	N	Weighted Incidence
Rappahannock River (cont'd)						
Hoghouse Bar Natives	23 Sep		4	12	84	0.24
	7 Oct	4	12	16	68	0.72
	6 Nov	4	16	8	72	0.76
	3 Dec	4	8	12	76	0.56
James River (1959 transplants)						
On Bottom	7 Oct	4	12	40	44	0.96
Tray R2 (Mar)	28 Aug	8	4	20	68	0.72
Tray R2 (Mar)	7 Oct	4	12	44	40	1.00
Tray R3 (Jun)	7 Oct	20	24	32	20	2.04
Tray R4 (Jul)	7 Oct	8	12	36	44	1.12
Tray R5 (Jul)	7 Oct	4		20	76	0.40
Smokey Point	2 Dec				100	0
Monaskon Bluff	2 Dec		8	4	88	0.28
Morattico Bar	2 Dec		4		96	0.12
Piankatank River						
Ganney Point	3 Dec		8	20	72	.44
Little Wicomico River						
Spriggs Ground	2 Sep	4		4	92	0.24
Potomac River						
Ragged Point	29 Oct				100	0
Chicken Cock	29 Oct			12	88	0.12
Nomini Creek	2 Sep			8	92	0.08
Western Shore, Chesapeake Bay						
Egg Island						
Plot 43	18 Aug		4	36	60	0.48
53	18 Aug	4	8	28	60	0.72
57	18 Aug	8	8	16	68	0.80
62	18 Aug	4	12	4	80	0.60
New Point-Wolf Trap						
Plot A1	18 Aug			4	96	0.04
18	18 Aug				100	0
19	18 Aug				100	0
24 & 25	18 Aug	4	4	8	84	0.40
Ocean View	18 Aug		12	36	52	0.72
Egg Island						
Plot 1	23 Sep	4	16	44	36	1.12
4 & 5B	23 Sep	4	12	16	68	0.72

Location	Date	Intensities of Infection by Percentages H	M	L	N	Weighted Incidence
Western Shore, Chesapeake Bay (cont'd)						
Egg Island						
Plot 43	23 Sep		24	48	28	1.20
Horn Harbor (Plot 2A)	23 Sep			4	96	0.04
Holland Straits	27 Oct	4	17	33	46	1.04
Eastern Shore, Chesapeake Bay, Virginia						
Bayside Creeks						
Cherrystone Inlet	13 Aug	8	24	20	48	1.32
	15 Sep		20	56	24	1.16
The Gulf	16 Jun				100	0
	14 Aug	4		48	48	0.68
Tray B3 (Feb '59)	15 Sep		4	8	88	0.20
Hungars Creek	15 Jul		12	12	76	0.48
Occohannock Creek	16 Jul		9	5	86	0.32
Seaside of Virginia and Maryland						
Cobb Island Bay	16 Jun				100	0
	13 Aug				100	0
Hog Island Bay	17 Jun				100	0
	15 Jul				100	0
Swash Bay	25 Jun				100	0
Machipongo Creek	15 Jul				100	0

Prevalence of *D. marinum* in Live Oysters Eastern Shore of Virginia, 1959

Hinton R. Hoese
Virginia Fisheries Laboratory

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Swash Bay & Bradford Bay	25 Aug	25				100	0
	3 Oct	25				100	0
	30 Dec	25				100	0
	25 Jun	25				100	0
Hog Is. Bay	17 Jun	25				100	0
	25 Aug	25				100	0
	26 Oct	25				100	0
	15 Jul	25				100	0
	1 Oct (SC)	25				100	0
	17 Dec (SC)	25				100	0
Outlet Bay	16 Dec	25				100	0
Machipongo R.	16 Sep	25				100	0
	15 Jul	25				100	0
Cobb Is. Bay	16 Jun	25				100	0
	13 Aug	25				100	0
	25 Aug	25				100	0
	10 Nov	25				100	0
	16 Dec	25				100	0
Messongo Cr.	8 Sep	25		4	4	92	0.16
	4 Dec	25			20	80	0.20
Chesconnessex Cr.	18 Sep (B-9)	25	4	20	44	28	1.18
	18 Sep (B-10)	25	4	16	36	44	1.04
	23 Oct	25		8	40	52	0.64
Occahannock Cr.	16 Jul	25		9	5	86	0.32
	3 Sep	25	4	8	40	48	0.84
Hungars Cr.	15 Jul	25		12	12	76	0.48
	7 Oct	25	12	16	52	20	1.60
The Gulf	16 Jun	25				100	0
	14 Aug	25	4		48	48	0.68
	3 Sep	25	4	20	44	32	1.24
	15 Sep (B-3)	25		4	8	88	0.20
	4 Dec	25			8	92	0.08
Cherrystone Cr.	13 Aug	25	8	24	20	48	1.32
	15 Sep	25		20	56	24	1.16
	20 Nov	25			12	88	0.24

Summary of Dermocystidium Infections in Oysters
at Hoghouse, Rappahannock River
7 October 1959

Source	No. tested	Per cent infections H	M	L	N	% infected	wt. incid.
Hoghouse (natives)	25	4	12	16	68	32	0.72
J.R. bottom (Mar)	25	4	12	40	44	56	0.96
R2 (J R -Mar)	25	4	12	44	40	60	1.00
R3 (Hoghouse natives)	25	20	24	32	20	80	2.04
R4 (tray with legs) (J R-July)	25	8	12	36	44	56	1.12
R5 (tray-no legs) (J R-July)	25	4		20	76	24	0.40

Occurrence of *Dermocystidium marinum* in Live Oysters
of the Chesapeake Area, 1960
(25 oysters per sample except as specified)

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
James River							
Brown Shoal	13 Jul					100	0
	31 Oct			12	12	76	0.48
	20 Sep		4	8	8	80	0.52
Wreck Shoal	21 Nov					100	0
J-6	25 Oct		8	24	36	32	1.48
J-5	18 Jul			4	8	88	0.20
J-4	25 Oct		8	16	44	32	1.32
J-2	27 Dec				4	96	0.04
Hampton Bar	3 Jun					100	0
Hampton Bar(natives)	28 Jun		4	12	12	72	0.68
Hampton Bar(bottom)	18 Jul			4	4	92	0.16
York River							
Mt. Folly	5 Jul					100	0
	20 Jul					100	0
Y-1	4 Oct					100	0
Y-2	4 Oct			4	4	92	0.24
Y-10	25 Nov			8	24	68	0.48
Y-11	22 Jul				4	96	0.04
	25 Nov				12	88	0.12
Y-12	25 Nov			8	20	72	0.44
Tillages Gr.	13 Jul				40	60	0.40
	23 Sep			4	20	76	0.32
Amoco	16 Dec			4	4	92	0.16
Amoco bottom	13 Jul		4	24	20	52	1.12
	22 Jul		8	24	4	64	1.16
Amoco strike	18 Aug		16	32	24	28	2.00
Mobjack Bay							
Plot 9	25 Jul					100	0
	16 Aug					100	0
	31 Aug					100	0
	19 Sep				4	96	0.04
	10 Oct					100	0
	20 Dec				8	92	0.08
Plot 11	5 Jul		4		8	88	0.28
	25 Jul		4	4	4	88	0.36
	16 Aug		8	8	16	68	0.80

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
		Mobjack Bay (continued)					
	31 Aug		12	16	8	64	1.16
	10 Oct		4	16	36	44	1.04
Plot 14, 15, 16	9 Aug					100	0
Plot 39, 41	9 Aug			4	8	88	0.20
Cuthbert E. Hughes	5 Jul					100	0
		Rappahannock River					
Parrotts Rock	26 Oct				12	88	0.12
Hoghouse Bar	31 May					100	0
	29 Jun				4	96	0.04
	8 Aug			4	4	92	0.16
	23 Aug				8	92	0.08
	4 Nov			8	28	64	0.52
R-6	4 Nov			8	12	80	0.36
R-3	4 Nov			16	56	28	1.04
McGinnis	22 Sep		4		12	84	0.32
Slaughters	3 Nov			4	8	88	0.20
Pocomoke	19 Oct		4	16	40	40	1.08
Nomini Creek	17 Aug					100	0
	24 Oct					100	0
Smith Creek-Tray #98	7 Jul		4		8	88	0.28
		Eastern Shore					
Cherrystone Cr. JR plants	22 Oct			8	24	68	0.48
Cherrystone Cr. B-1 & B-2	1 Nov			24	16	60	0.88
Cherrystone Cr. SC oysters	1 Nov			8	8	84	0.32
Cherrystone Cr. Seaside seed	1 Nov		4	8	20	68	0.64
Cherrystone Cr. JR seed	1 Nov			12	16	72	0.52
McCredy's S. Carolina	1 Nov					100	0
S-12	2 Nov					100	0
		Ocean View					
Plot 4	28 Jul		4			96	0.20
	8 Aug					100	0
Plot 5, 6	8 Aug		8	8		84	0.64

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
		Ocean View (continued)					
Plot 4,5-Egg I.	29 Aug		4		4	92	0.24
Plot 43	29 Aug			4		96	0.12
		VIMS Pier, Gloucester Point, Va.					
Tray No.							
98	7 Jul		4		8	88	0.28
102	8 Jul			4		96	0.12
	25 Aug		8	16	20	56	1.08
	3 Oct			56	28	16	1.96
	18 Nov		4	28	28	40	1.32
105	8 Jul					100	0
112	8 Jul					100	0
113	8 Jul					100	0
	30 Nov		4	12	20	64	0.76
114	11 Jul					100	0
117	15 Dec				20	80	0.20
118	1 Dec					100	0
120	1 Dec					100	0
121	1 Dec					100	0

Prevalence of *D. marinum* in Live Oysters Eastern Shore of Virginia, 1960

Hinton D. Hoese
Virginia Fisheries Laboratory

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Swash & Bradford Bays	8 Jun	25				100	0
	7 Jul	25				100	0
	12 Jul	25				100	0
Hog Is. Bay	17 Sep	50				100	0
	17 Sep (SC)	25				100	0
	19 Jul (SC)	25				100	0
	19 Jul	25				100	0
Outlet Bay	4 Oct (S-7)	25				100	0
Cobb Is. Bay	2 Nov (S-12)	25				100	0
Messongo Cr.	29 Jun	25				100	0
	26 Aug	25	12	4	24	60	0.96
	3 Oct	25		4	4	92	0.16
(B11, B12)	14 Nov	25		4	16	80	0.28
Chesconnessex Cr.	3 Aug	25		8	66	36	0.88
Nandua Cr.	?	25		4	8	88	0.20
Occahannock Cr.	30 Jun	25		4	32	64	0.44
	14 Nov	25		4	4	20	0.52
Hungars Cr.	3 Oct	25	4	4	28	64	0.60
	8 Nov (B-14)	25		8	16	76	0.40
	8 Nov (B-6)	25			8	92	0.08
The Gulf	8 Jul	25		16	24	60	0.82
	12 Aug (B-3)	25	4	4	28	64	0.60
	22 Aug	25		20	56	24	1.16
	7 Oct	25			8	92	0.08
	18 Nov	25			24	76	0.25
	18 Nov (B4,5)	25		8	40	52	0.60
Cherrystone Cr.	21 Jul (S)	25		4	16	80	0.28
	10 Aug (SC)	25			12	88	0.12
	26 Sep (JR)	25		8		92	0.24
	22 Oct (JR)	25		8	24	68	0.48
	1 Nov (JR)	25		12	16	72	0.52
	1 Nov (JR)	25	4	8	20	68	0.64
	1 Nov (SC)	25		8	8	84	0.32
	1 Nov (B1,2)	25		24	16	60	0.88
Tangier Sound	16 Aug	25			16	84	0.16

Occurrence of *Dermocystidium marinum* in Live Oysters of the Chesapeake Bay Area, 1961

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
James River							
Brown Shoal	14 Nov	25	0	0	8	92	0.08
"	28 Sep	25	0	0	8	92	0.08
Wreck Shoal	31 Oct	25	0	0	0	100	0
J-2	6 Oct	25	0	32	24	44	1.20
J-6	6 Oct	25	0	20	16	64	0.76
J-7	6 Oct	25	0	0	4	96	0.04
York River							
Y-1	10 Nov	25	0	0	12	88	0.12
Y-2	18 Oct	25	4	36	20	40	1.48
Foxes Creek	13 Sep	25	0	4	8	88	0.20
Y-10	18 Oct	25	0	4	4	92	0.86
Y-14	18 Oct	25	0	0	0	100	0
Tillage's	16 Aug	25	4	12	13	71	0.78
Amoco (natives)	9 Aug	25	0	8	12	80	0.36
"	29 Aug	25	4	8	12	76	0.56
Mobjack Bay							
Plot 10	10 Jul	25	0	0	0	100	0
"	12 Sep	25	0	0	0	100	0
Rappahannock River							
Hoghouse	8 Sep	25	4	0	0	96	0.20
"	25 Sep	22	0	0	4	96	0.04
"	23 Oct	25	0	0	0	100	0
R-3	25 Jul	25	0	0	0	100	0
Drummond Gr.	30 Nov	25	0	0	8	92	0.08
Parrott's Rock	30 Nov	25	0	0	0	100	0
Broad Cr.	30 Nov	25	0	0	0	100	0
Piankatank River							
Middle Gr.	30 Nov	25	0	4	8	88	0.20
Nomini Creek							
Nomini Creek	12 Sep	25	0	0	0	100	0

Tray No.	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
		Tray Oysters at VIMS Pier					
102	26 Jul	23	4.5	4.5	4.5	86	0.36
111-A	18 Aug	31	0	0	6	94	0.08
123	4 Oct	25	0	0	4	96	0.04
128	26 Jul	25	0	0	0	100	0
"	13 Sep	25	0	8	4	88	0.28
"	25 Oct	25	0	4	4	92	0.08
129	13 Sep	25	4	0	8	88	0.28
"	26 Oct	25	0	12	4	84	0.40
131	4 Oct	25	0	20	4	76	0.64
133-A	13 Sep	25	4	4	8	84	0.40
"	26 Oct	25	0	12	8	80	0.44
133-B	13 Sep	25	0	4	8	88	0.20
"	13 Nov	25	0	12	4	84	0.40
134	4 Oct	25	0	0	4	96	0.04
135	13 Sep	25	4	12	0	84	0.56
136	4 Oct	25	0	8	0	92	0.24
137	18 Oct	25	8	20	28	44	1.28
138	30 Oct	25	0	16	12	72	0.45
139	30 Oct	25	0	16	28	56	0.76
Shellbag 85	18 Aug	25	0	0	0	100	0
"	13 Sep	25	0	0	0	100	0

Occurrence of Dermocystidium marinum in Live Oysters
from Bayside of Eastern Shore Trays, 1961

Tray	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
B1	14 Jul	25		4	12		0.24
	3 Nov	25	4		24	72	0.44
B3	12 Oct	25	8	16	36	40	1.24
B5	27 Oct	25		12	36	52	0.72
B7	14 Aug	25	16	16	32	36	1.60
B13	11 Jul	25			4	96	0.04
	11 Aug	25				100	0
	7 Sep	25			12	88	0.12
	12 Oct	25			12	88	0.12
B16	6 Oct	25				100	0
B18	27 Oct	25	4		12	84	0.32
B20	15 Aug	25				100	0
B21	27 Sep	25		4	4	92	0.16
S24	5 Oct	21		10		90	0.48

Occurrence of Dermocystidium marinum in Live Oysters of the Chesapeake Area, 1962

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
		James River					
Brown Shoal	27 Jul	25		4		96	0.12
	14 Aug	25				100	0
	7 Sep	25				100	0
	24 Sep	25		8		92	0.24
	29 Oct	25			4	96	0.04
J-3	8 Oct	24		13	8	79	0.46
Hampton Bar W. W. Abbott	25 Oct	25			4	96	0.04
		York River					
Amoco Station	22 Aug	25	8	12	20	60	0.96
Tillages Gr.	10 Oct	25		13	7	80	0.47
Y-14	10 Oct	25		8		92	0.25
Y-15	27 Oct	25				100	0
Y-1	11 Oct	25	12	60	24	4	2.04
Foxes Creek	25 Jul	25		4	16	80	0.28
	17 Aug	25	8	8	12	72	0.76
	19 Sep	25		16	28	56	0.52
	11 Oct	25		12	40	48	0.76
		Mobjack Bay					
MJ-6	5 Sep	25				100	0
Plot 14-16	5 Jul	25				100	0
	20 Jul	25				100	0
	6 Aug	25				100	0
	22 Aug	25				100	0
	5 Sep	25				100	0
	21 Sep	25				100	0
	25 Oct	25				100	0
Plot 21	5 Sep	25				100	0
	21 Sep	25				100	0
	25 Sep	25				100	0
		Severn River					
Elmer Coates	10 Sep	25	12	36	16	36	1.84
Mann Conway	10 Sep	25		24	4	72	0.72

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
Rappahannock River							
Hoghouse	16 Jul	25	4			96	0.20
	7 Aug	25		8		92	0.24
	11 Sep	25			12	88	0.12
	26 Sep	25		12	4	84	0.28
	8 Nov	25	4		8	88	0.28
R-11	11 Sep	25	8	40	24	28	1.84
Miscellaneous							
W. H. Rowe	11 Sep	25		8		92	0.24
C. W. Nuttall	11 Oct	20		5	10	85	0.16
Milford Haven							
Haven AEC	4 Jan	25				100	0
Natural Bottom	22 Oct	25				100	0
Poly Bottom	22 Oct	25				100	0
Circular Trough	14 Nov	25	4			96	0.20
River Trough	14 Nov	25	13	7	13	67	1.00
VIMS Pier, Gloucester Point, Va.							
Tray No.							
125	30 Jul	25	8	4	12	76	0.64
127	8 Jan	25				100	0
	28 Jun	25		4	4	92	0.16
	29 Aug	25	16	4	32	48	1.24
	12 Oct	22		62	19	19	2.05
131	30 Jul	10	20	50	10	20	4.60
133-A	9 Jan	25				100	0
133-B	9 Jan	25				100	0
135	8 Jun	25		4	12	84	0.24
	19 Jul	25	4	16	12	68	0.80
136	19 Jul	25				100	0
137	28 Jun	25	8	4	16	72	0.68
	30 Jul	25	12		20	68	0.80
138	28 Jun	25	8	16	20	56	1.08
	29 Aug	25	28	16	40	16	2.28
139	9 Jan	25			4	96	0.40
	29 Jun	25	4	4	12	80	0.44
	29 Aug	25	32	24	32	12	2.64
140	30 Jul	25		4		96	0.12
	29 Aug	25	12	4	12	76	0.84
141	28 Aug	25		4	16	80	0.16
	30 Aug	25		8	16	76	0.64

Tray No.	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
VIMS Pier, Gloucester Point, Va. (continued)							
142	30 Oct	25	4	4	20	72	0.52
143	29 Jun	25				100	0
	28 Aug	25		12	16	72	0.52
	30 Oct	25	12	8	44	36	1.12
144	18 Jul	25				100	0
	28 Aug	25	12	4	8	76	0.80
	1 Nov	25	20	16	32	32	1.80
145	28 Aug	25	4		20	76	0.40
	1 Nov	25		4	8	88	0.20
147	28 Aug	25	16	8	28	48	1.32
	31 Aug	25		4	12	84	0.36
148	30 Oct	25			12	88	0.12

Occurrence of *Dermocystidium marinum* in Live Oysters in the Chesapeake Area, 1963

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
		James River					
Brown Shoal	2 Aug	25				100	0
	15 Aug	25				100	0
	28 Aug	25				100	0
	27 Aug	25				100	0
Wreck Shoal	4 Nov	25				100	0
J-2	28 Oct	25			4	96	0.04
J-11	28 Oct	25				100	0
Miles Watch House	19 Sep	25				100	0
Hampton Bar	26 Nov	25		4		96	0.12
Hampton Bar (B.C.Burton & Sons)	27 Aug	25				100	0
Lovetts Bar(Eliz.R)	4 Sep	25	4		44	62	0.64
		York River					
Y-16	1 Aug	25				100	0
Rosser Blake	26 Sep	25		4	4	92	0.16
Wm. Rowe	25 Jul	25				100	0
	28 Jul	25				100	0
Y-15	25 Oct	25	4		36	60	0.56
Y-17	5 Aug	25			4	96	0.04
	25 Oct	25				100	0
Y-18	25 Oct	25				100	0
M. L. Tillage	28 Jul	25				100	0
		Severn River					
Severn R.	16 Oct	25		4		96	0.12
		Mobjack Bay					
Cuthbert & Hughes	16 Aug	25				100	0
	30 Aug	25				100	0
	1 Oct	25				100	0
Spring plant.	16 Dec	25				100	0
Fall plant.	16 Dec	25				100	0
MJ-6	19 Jun	25				100	0
MJ-7	12 Nov	25				100	0
MJ-8	6 Aug	25				100	0
	1 Oct	25				100	0
MJ-9	6 Aug	25				100	0

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
		Mobjack Bay (continued)					
MJ-9	1 Oct	25				100	0
Ballards Egg Is.	20 Aug	25				100	0
	17 Dec	25				100	0
		Rappahannock River					
Hoghouse Bar	9 Aug	25		4		96	0.12
	12 Sep	25				100	0
	31 Oct	25				100	0
	2 Dec	25				100	0
Broad Creek	4 Dec	21				100	0
Drummond Ground	4 Dec	25				100	0
Parrotts Rock	4 Dec	25				100	0
		Piankatank River					
Piankatank (below black can)	4 Dec	25				100	0
Pocomoke Sound (off old rock)	16 Nov	25				100	0

Occurrence of *Dermocystidium marinum* in Live Oysters in the Chesapeake Bay Area, 1964

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
James River							
Brown Shoal	3 Mar	25				100	0
MSX Survival	17 Jun	25				100	0
	17 Jun	25				100	0
	6 Aug	25				100	0
MSX Survival	7 Aug	25		4	4	92	0.16
	23 Nov	25			4	96	0.04
Wreck Shoal	17 Jun	25				100	0
MSX Survival	17 Jun	25				100	0
	11 Aug	25				100	0
	11 Sep	25				100	0
	23 Nov	25				100	0
Horsehead	17 Jun	25				100	0
MSX Survival	17 Jun	25				100	0
Rainbow Rock	17 Jun	25				100	0
MSX Survival	17 Jun	25				100	0
	23 Nov	25				100	0
Miles Watch House	27 Aug	25				100	0
Oyster Rock	23 Nov	25				100	0
Inshore Gun Rock	23 Nov	25				100	0
White Shoal Light	23 Nov	25				100	0
Bell 11 JR	27 Nov	25		4		96	0.12
J-13	11 Sep	25				100	0
	27 Nov	25				100	0
Nansemond Ridge	4 Nov	25	8	4	32	56	0.84
Hampton Roads							
J-12	20 Aug	25				100	0
	4 Nov	25				100	0
Hampton Bar	8 Jun	25		4		96	0.12
	13 Aug	25				100	0
Old Survivors	23 Nov	25		4		96	0.12
weak	19 Nov	18				100	0
York River							
Y-16	31 Jan	25				100	0
	17 Nov	25				100	0
Wm. Rowe							
JR seed 1 yr.	27 Jul	25				100	0
JR seed 2 yr.	27 Jul	25				100	0

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
York River (continued)							
Wm. Rowe							
JR seed 2 yr.	19 Aug	25		4		96	0.12
JR seed 1 yr.	16 Sep	25				100	0
JR seed 1 yr.	17 Nov	25			4	96	0.04
Tillages							
Y-17	8 Apr	25				100	0
	2 Nov	25				100	0
Y-18	29 Jan	25				100	0
	8 Apr	25				100	0
	5 Aug	25				100	0
	2 Nov	25				100	0
Y-19	5 Aug	25				100	0
	25 Sep	25				100	0
	2 Nov	25				100	0
Y-20	6 Aug	25				100	0
	2 Nov	25				100	0
Ed Blake (Janny Pt.)	20 Aug	25				100	0
Green Rock	27 Nov	25				100	0
Pages Rock	2 Dec	25				100	0
Foxes Cr. (old tray)	2 Dec	25			12	88	0.12
Purton Bay 2 yr. JR seed	2 Dec	25	4		4	92	0.24
Leighs opp. Clay Bank Pier 2 yr. old JR seed	2 Dec	25	4	8	16	72	0.60
Mobjack Bay							
Plot 42, Egg Island Inner	23 Nov	25				100	0
	10 Mar	25				100	0
Hughes	27 Jul	25				100	0
	19 Aug	25				100	0
MJ-11	4 Sep	25				100	0
	18 Nov	25				100	0
Piankatank River							
Deep Rock	28 Oct	25				100	0
Middle Ground	10 Nov	25				100	0
Rappahannock River							
Hoghouse Bar	22 Jul	25				100	0
natural bed	19 Oct	25			4	96	0.04

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
		Rappahannock River (continued)					
Hoghouse Bar							
bar	10 Nov	25			4	96	0.04
bar	10 Dec	25				100	0
Smokey Point	19 Oct	25				100	0
	12 Nov	25			4	96	0.04
Broad Creek	10 Nov	25				100	0
Parrotts Rock	10 Nov	25				100	0
Rogues Hole	10 Nov	25				100	0
Burton Point	10 Nov	25				100	0
Drummond Ground	10 Nov	25		4		96	0.12
Nomini Creek	10 Aug	25				100	0
JR 2 yr. olds	10 Aug	25				100	0
		Potomac River					
Ragged Point	5 Nov	25				100	0
Great Neck	5 Nov	13				100	0
Cornfield Harbor	5 Nov	25				100	0
		VIMS Pier, Gloucester Point, Va.					
Tray No.							
DB-1	1 Jun	25				100	0
	6 Oct	24				100	0
DB-2	29 May	25				100	0
	5 Aug	25				100	0
	6 Oct	25				100	0
DB-3	28 May	25				100	0
	5 Aug	25				100	0
	2 Nov	25				100	0
DB-4	28 May	24				100	0
	21 Aug	25				100	0
	2 Nov	25				100	0
RP's	15 Jul	25			4	96	0.04
	21 Aug	25				100	0
	18 Sep	25				100	0
	15 Dec	25				100	0
RE's	15 Jul	25				100	0
	21 Aug	25				100	0
	18 Sep	25				100	0
	15 Dec	25				100	0
RM's	15 Jul	25				100	0
	21 Aug	25				100	0

Tray	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
VIMS Pier, Gloucester Point, Va. (continued)							
RM's	18 Sep	25				100	0
	15 Dec	25				100	0
Tray 151	19 Aug	25		4		96	0.12
	2 Oct	25				100	0
153	28 Jan	27				100	0
	10 Jul	25				100	0
155	19 Aug	25				100	0
Prox. Green 1963 lot #1	17 Jun	25				100	0
Prox. #5	18 Nov	25				100	0
Prox. #6	18 Nov	25				100	0

Occurrence of *Dermocystidium marinum* in Live Oysters of the Chesapeake Area, 1965

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
		James River					
Brown Shoal Sta. #2	12 Nov	25		12	24	64	0.60
JR Sta. #10 WS inshore	9 Nov	25	4		8	88	0.28
Nansemond Ridge	8 Nov	25	4	32	28	36	1.44
J-13	9 Nov	25	4	8	20	68	0.64
J-12	29 Dec	25				100	0
		York River					
Pages Rock	29 Nov	25			4	96	0.04
Y-18	20 Oct	25				100	0
Y-20	20 Oct	25		4	4	92	0.16
Y-21	20 Oct	25				100	0
Y-22	20 Oct	25			4	96	0.04
Y-24	20 Oct	25		4	4	92	0.16
1965 Mobjack around Tillages on bottom	29 Sep	25		4	8	88	0.20
	15 Dec	25				100	0
		Around VIMS					
P-3A	22 Sep	25	4		12	84	0.32
P-4A	22 Sep	25				100	0
P-8	21 Oct	25	4	4	24	68	0.56
RM's bottom	29 Sep	25			8	92	0.08
	15 Dec	24			4	96	0.04
RP's bottom	29 Sep	23				100	0
Tray RP-1	30 Nov	25				100	0
RE bottom	30 Nov	25			4	96	0.04
HB bottom	15 Dec	25			4	96	0.04
Y-23	20 Oct	25				100	0
Y-25	15 Dec	25			8	92	0.08
		Mobjack Bay					
MJ-13	25 Oct	25				100	0
MJ-14	25 Oct	25			16	84	0.16

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities H	M	L	N	Weighted Incidence
		Chesapeake Bay					
Deep Rock	26 Oct	25				100	0
		Piankatank River					
63 Shellplants	24 Nov	25				100	0
Burton Pt. natives	24 Nov	25				100	0
Piney I. Shellplants	23 Nov	25				100	0
		Rappahannock River					
Drummond Ground	23 Nov	25				100	0
Hoghouse	23 Nov	23			9	91	0.09
Morattico	23 Nov	24				100	0
		Pocomoke & Others					
Haynes Bar-Gr. Wic.	14 Oct	24		8	33	59	0.58
Ragged Pt.-Pot.R.	21 Sep	25				100	0
Hog I. naturals Seaside	22 Sep	25			4	96	0.04
Cornfield Harbor Potomac R.	22 Sep	25				100	0
Pocomoke 63 Gun Rock Plants	4 Oct	25				100	0

Occurrence of *Dermocystidium marinum* in Live Oysters of the Chesapeake Area, 1966
(25 oysters per sample except as specified)

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensitites				Weighted Incidence
			H	M	L	N	
		James River					
Brown Shoal	3 Oct		8		12	80	0.52
Brown Shoal	8 Nov				12	88	0.12
Horsehead	3 Jan					100	0
Darling corner stakes & compt.	29 Sep		8	12	60	20	1.36
Darling corner stakes & middle compt.	29 Sep		8	24	28	40	1.40
Wreck Shoal	13 Sep					100	0
Wreck Shoal	8 Nov					100	0
White Shoal	3 Oct		4		4	72	0.24
Deep Water Shoal	29 Sep					100	0
Gun Rock	3 Oct				16	84	0.16
Gun Rock	8 Nov		4			96	0.20
J-15	19 Sep			8	32	60	0.56
J-15	5 Dec			8	28	64	0.16
J-14	19 Sep					100	0
J-14	6 Dec					100	0
Nansemond Ridge	25 Oct			20	20	60	0.80
		York River					
Y-26	15 Sep	23	4		4	90	0.26
Y-28	5 Oct					100	0
Y-29	7 Oct			4		96	0.12
Y-30X(Dana's)	6 Oct					100	0
Y-33	20 Oct				4	96	0.04
Y-34	14 Dec					100	0
Y-35	20 Oct					100	0
Y-35	14 Dec					100	0
Mobjack '65, Tillages Ground on bottom	19 Jul					100	0
Ferry Pier, Natives '64 set	20 Oct					100	0
VIMS Pier, Natives '64 set	20 Oct			8		92	0.40
Wm. Rowe Gr., J. R. seed 1 yr. old	6 Dec	24	8	4	12	75	0.67

Mobjack

MJ-14	7 Oct				100	0
MJ-15	7 Oct				100	0

Progeny Trays

P-2A	12 Sep	4	12	16	68	0.72
P-2A	29 Nov		16	36	48	0.84
P-3A	12 Sep	4	4	8	84	0.40
P-3A	30 Nov	8	4	16	72	0.68
P-4A	12 Sep	4			96	0.20
P-4A	29 Nov	4	4		92	0.32
P-5A	12 Sep	16	12		72	1.16
P-5A	29 Nov	8	4	48	40	1.00
P-6	8 Sep				100	0
P-6X	5 Oct				100	0
P-6X	29 Nov				100	0
P-7X	9 Sep				100	0
P-7X	19 Nov				100	0
P-8	9 Sep	4	8	24	64	0.68
P-8	1 Dec	4	8	20	68	0.64
P-9	12 Sep			4	96	0.04
P-9	1 Dec			4	96	0.04
P-10	8 Sep				100	0
P-10	30 Nov				100	0
P-11	12 Sep	28	8	28	36	1.92
P-11	1 Dec		8	28	64	0.40
P-12	15 Sep				100	0
P-12X	30 Dec				100	0
P-13	3 Jan				100	0
P-13A	16 Sep				100	0
P-13	9 Nov				100	0
P-13A	30 Dec				100	0
P-14	16 Sep				100	0
P-14	2 Dec				100	0
P-15	8 Dec				100	0
P-16	5 Oct				100	0
P-16	2 Dec				100	0
P-18 extras	27 Sep			4	96	0.04
P-18X	5 Dec				100	0
P-20X	27 Sep		4		96	0.12
P-20	15 Dec				100	0
P-22	27 Sep				100	0
P-22X	15 Dec				100	0
P-24	13 Sep				100	0
P-24	1 Dec			4	96	0.04
P-25	8 Dec				100	0
P-26	13 Sep				100	0
P-26	1 Dec				100	0
P-27	28 Sep				100	0

P-27X	16 Dec			100	0
P-28 (Horsehead)	28 Sep			100	0
P-28 (counted group)	16 Dec			100	0

Rappahannock River

3 branches '64 shellplants	5 Dec			100	0
Hoghouse	1 Nov		4	96	0.04
R-12	12 Dec	22		100	0
Goose Point	1 Nov			100	0
Morattico	1 Nov			100	0
Rogues Hale	1 Nov			100	0
Bluff Rock	1 Nov			100	0
Smokey Pt.	1 Nov	23		100	0

Occurrence of Dermocystidium marinum in Live Oysters
of the Chesapeake Bay, 1967
(25 oysters per sample except as specified)

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensitites				Weighted Incidence
			H	M	L	N	
		James River					
Brown Shoal	28 Sep			8	16	76	0.40
Brown Shoal	24 Oct		4		28	68	0.48
Wreck Shoal	23 Oct				4	96	0.04
J-16	26 Sep					100	0
J-17	26 Sep					100	0
J-18	5 Oct					100	0
Lynnhaven Bay	15 Nov		16		12	72	0.92
		Mobjack Bay					
MJ-6	22 Sep		4	4		92	0.32
MJ-15	22 Sep					100	0
MJ-16	22 Sep					100	0
		York River					
Y-22	3 Oct	24	28	12	24	32	2.00
Y-27	3 Oct					100	0
Y-34	3 Oct		4			96	0.20
Y-37	9 Oct					100	0
Y-39	6 Oct					100	0
Y-41	9 Oct				8	92	0.07
Y-42	9 Oct				4	96	0.04
Y-43	9 Oct				4	96	0.04
Pages Rock	20 Nov			4		96	0.12
Bell Rock	20 Nov					100	0
VIMS Pier (natives off pilings)	14 Jul					100	0
VIMS Pier	14 Aug					100	0
VIMS Pier	25 Oct					100	0
B.F. Walker, Sr.	31 Oct		4	8	20	68	0.64
Y.R.O.C. Old Nat.	20 Jul		4	12	12	72	0.68
Y.R.O.C. Nat.	20 Jul				8	92	0.08
HB-1	10 Oct		8	12	24	52	1.00
HB-2	10 Oct		16	24	28	32	1.80
RM-1	10 Oct					100	0
DB-1	10 Oct		16	20	32	32	1.72
RE-1	10 Oct			4	4	92	0.16

Rappahannock River

Hoghouse Bar	31 Oct	24				100	0
Piank. '65 moved to Mob. '66	25 Sep					100	0

Potomac River

Jones Shore	5 Sep					100	0
Cornfield Harbor	5 Sep					100	0
Ragged Point	5 Sep					100	0

Progeny Trays

P-3 A	19 Oct	27	12	15	36	21	1.68
P-6 C	29 Sep				4	96	0.04
P-6 A	29 Sep		4	8	4	84	0.44
P-7 C	29 Sep		8	4		88	0.52
P-8 C	19 Oct		40	12	32	16	2.68
P-9 C	19 Oct		8	16	52	24	1.40
P-10 C	29 Oct				4	96	0.04
P-12 X	17 Oct					100	0
P-13 A	17 Oct					100	0
P-13 A	9 Oct				4	96	0.04
P-14	19 Oct			4	8	88	0.20
P-16 C	17 Oct					100	0
P-17 C	27 Oct					100	0
P-18 C	17 Oct					100	0
P-19 C	17 Oct		4			96	0.20
P-20 C	20 Oct					100	0
P-21 C	4 Oct					100	0
P-22 X	20 Oct				4	96	0.04
P-27 A	20 Oct					100	0
P-27 X	19 Sep					100	0
P-30 X	3 Oct					100	0
P-31 X	10 Oct					100	0
P-32 X	11 Oct					100	0
P-33 X	11 Oct				4	96	0.04
P-34 X	11 Oct					100	0

Occurrence of *Dermocystidium marinum* in Live Oysters
of the Chesapeake Bay, 1968
(25 oysters per sample except as specified)

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensitites				Weighted Incidence
			H	M	L	N	
		James River					
Brown Shoal	28 Aug				4	96	0.04
		York River					
Y-33	13 Aug		4			96	0.20
Y-40	14 Oct	24		12	40	44	0.76
Y-43	4 Nov					100	0
Y-45	4 Nov					100	0
Y-48	15 Oct					100	0
Y-51	8 Oct		4		4	92	0.24
		VIMS Pier					
P-13A	27 Aug					100	0
P-16	27 Aug		4		4	92	0.24
P-48 C	16 Oct		4	12	8	76	0.64
Cult. 17-68	3 Oct					100	0
Calif. Free Spat	25 Sep					100	0
Piank. '65-VIMS '67	20 Jul					100	0
		Piankatank & Rappahannock Rivers					
PK-1	23 Oct					100	0
R-14	23 Oct					100	0
		Progeny Trays - Off Tillages					
P-31 X	11 Oct					100	0
P-32 A	12 Sep					100	0
P-32 X # 4	11 Oct					100	0
P-37 X	11 Sep				4	96	0.04
P-40 X	16 Sep				4	96	0.04
P-42 X	16 Sep					100	0
P-44 X	16 Sep					100	0
P-53	16 Oct					100	0

Progeny Trays off - VIMS

P-6 C	13 Aug		8		8	84	0.48
P-6 A	7 Oct	24	24	16	48	8	2.16
P-6 A	3 Dec		4	12	44	40	1.00
P-6 X	30 Aug		24	16	32	28	2.00
P-7 X	30 Aug				8	92	0.04
P-10	30 Aug		4		4	92	0.24
P-12	7 Oct	24	24	20	32	24	1.92
P-19	21 Oct					100	0
P-20 C	7 Nov		8	12	32	48	1.08
P-20 X	3 Sep		4	16	20	60	0.88
P-22	3 Sep				4	96	0.04
P-21 X	3 Sep	24	8	4		84	0.52
P-29 AX	3 Sep				4	96	0.04
P-29 AX	3 Oct				4	96	0.04
P-27 X	3 Sep					100	0

Occurrence of Dermocystidium marinum in Live Oysters and Tray Oysters in the Chesapeake Bay, 1969 (25 oysters per sample)

Location	Date	Intensities of Infection by Percentages H	M	L	N	Weighted Incidence
James River						
Wreck Shoal	13 Nov				100	0
J-16	31 Oct				100	0
J-19	31 Oct				100	0
J-19	19 Aug				100	0
J-20 Brown Shoal	10 Sep	8	8	48	36	1.12
J-20	13 Nov	16	20	8	56	1.48
Nansemond River	17 Nov			4	96	0.04
York River						
Y-49	7 Nov	4		4	92	0.24
Y-55	14 Aug				100	0
Y-55 (23 oysters sampled)	8 Dec				100	0
Y-56	4 Sep				100	0
Y-57	15 Sep				100	0
Y-58	26 Aug			12	88	0.12
Rappahannock and Potomac Rivers						
R-14	8 Sep				100	0
R-15	12 Nov				100	0
Cornfield Harbor	30 Oct				100	0
Joneses Shore	30 Oct				100	0
(Tillages) Progeny Trays (York River Above Bridge 1/2 Mile)						
P-6	25 Aug	12	8	68	12	1.52
P-7	25 Aug			28	72	0.28
P-20	7 Jul	8	4	8	80	0.60
P-21	28 Oct	4	24	44	28	1.36
P-21A	26 Aug			4	96	0.04
P-22	18 Sep				100	0
P-29	31 Oct				100	0
P-31X	22 Aug				100	0
P-31X	24 Oct		4		96	0.12
P-32 A # 6	22 Sep	16	8	28	48	1.32
P-32 A # 6	11 Aug	12		8	80	0.68
P-32	4 Sep	8	4		88	0.52
P-34	8 Oct	8	4	20	68	0.52

Location	Date	Intensities of Infection by Percentages H	M	L	N	Weighted Incidence
(Tillages) Progeny Trays (York River Above Bridge 1/2 Mile (cont'd)						
P-35	3 Sep	8		12	80	0.52
P-35C	8 Oct	40	12	36	12	2.72
P-36	31 Oct				100	0
P-37C & X	27 Oct	4	4		92	0.32
P-37A	27 Oct	4		8	88	0.28
P-37X	12 Aug				100	0
P-40	27 Oct				100	0
P-41	31 Oct				100	0
P-41BX	7 Nov				100	0
P-43A (22 oysters sampled)	7 Nov				100	0
P-44X	27 Oct	4	4	4	88	0.38
P-45	23 Sep				100	0
P-45C	25 Aug				100	0
P-45Bx	7 Nov				100	0
P-47C	1 Aug				100	0
P-49C	28 Aug				100	0
P-50C (24 oysters sampled)	28 Aug				100	0
P-51X	27 Oct			8	92	0.08
P-51X	28 Aug				100	0
P-52	12 Dec				100	0
P-53	13 Aug				100	0
P-53 runts (24 oysters sampled)	7 Oct				100	0
P-54X	15 Sep				100	0
P-54X	19 Nov				100	0
P-55X	16 Sep				100	0
P-55X	24 Nov		4	12	84	0.24
P-56X	7 Oct				100	0
P-57X	8 Oct				100	0
P-58X	24 Nov				100	0
P-63A	25 Sep				100	0

Occurrence of *Dermocystidium marinum* in Live Oysters
of the Chesapeake Bay area, 1970
(25 oysters per sample except as specified)

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensitites				Weighted Incidence
			H	M	L	N	
		James River					
J-22	22 Sep					100	0
J-23	22 Sep	22			4	96	0.04
		Rappahannock River					
R-20	14 Sep	24				100	0
R-20	13 Nov					100	0
R-22	13 Nov			12	4	84	0.40
		Potomac River					
Cornfield	24 Aug			4		96	0.12
Ragged Pt.	24 Aug					100	0
		York River					
Y-61	6 Oct					100	0
Y-62	6 Oct	24			24	76	0.25
Y-63	1 Nov			8	8	84	0.32
Y-64	1 Nov	24	8	12	28	48	1.04
Y-60 A	17 Nov	24				100	0
		(Progeny's) (York River above Bridge) Tillages					
P-6	4 Sep				28	72	0.28
P-37	2 Oct			28	36	36	1.20
P-32 # 3	26 Aug					100	0
P-40	2 Oct	22				100	0
P-43	16 Sep					100	0
P-43	10 Dec					100	0
P-44	24 Sep		8	24	32	36	1.44
P-46	10 Dec		4	28	32	36	1.36
P-51 A	27 Aug					100	0
P-51 S	16 Sep		20	16	20	44	1.68
P-52 S	10 Dec					100	0
P-52 # 2	26 Aug			4		96	0.12
P-54	27 Aug					100	0
P-54	30 Nov					100	0

P-55 X	16 Sep	24	4	4	4	88	0.37
P-55	30 Nov		4	8	24	64	0.68
P-56	5 Oct				4	96	0.04
P-56	30 Nov				4	96	0.04
P-61	10 Dec					100	0
P-64	28 Oct		24	8	36	32	1.80
P-64	15 Sep		12	4	16	68	0.88
P-65	1 Oct					100	0
P-66	28 Aug					100	0
P-67	11 Dec					100	0
P-68	1 Oct			4	8	88	0.20
P-69	15 Sep		8		32	60	0.72

Occurrence of *Dermocystidium marinum* in Live Oysters
of the Chesapeake Bay Area, 1971
(25 oysters per sample except as specified)

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensitites H	M	L	N	Weighted Incidence
		James River					
J-25	20 Sep					100	0
J-26	20 Sep					100	0
J-27	20 Sep	24				100	0
		Piankatank & Rappahannock Rivers					
PK-5	3 Nov					100	0
R-25	3 Nov					100	0
		York River					
Y-66	13 Oct				8	92	0.08
	Progeny Trays (Tillages, York River above Bridge)						
P-44	4 Oct		28	28	36	8	2.60
P-56	28 Sep		8	4	28	60	0.80
P-60	19 Aug		12	8	28	48	1.12
P-63	8 Jul		12	20	24	44	1.44
P-64	4 Oct	24		20	56	20	1.16
P-65	29 Sep					100	0
P-67	28 Sep				20	80	0.20
P-68	29 Sep					100	0
P-69	8 Jul		8	8	12	72	0.76
P-70	8 Jul					100	0
P-71	29 Sep		8	8	28	56	0.92
P-72	29 Sep				8	92	0.08
P-75	28 Sep					100	0
P-77	28 Sep					100	0
P-78 X	17 Aug					100	0
P-79	28 Sep				16	84	0.16
P-80	28 Sep				8	92	0.08
P-81	28 Sep					100	0

Occurrence of Dermocystidium marinum in Live Oysters
of the Chesapeake Bay area, 1972
(25 oysters per sample except as specified)

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensitites				Weighted Incidence
			H	M	L	N	
		James River					
J-29	4 Oct					100	0
		Mobjack Bay					
MJ-23	13 Oct					100	0
		South Carolina					
Vic Burrell	14 Jun				20	80	0.20
		York River					
Y-69	6 Jun					100	0
Y-73	2 Oct					100	0
		Progeny Trays (York R. above Bridge) Tillages					
P-64	10 Apr				4	96	0.04
P-68	7 Sep					100	0
P-72	2 Oct		12	8	48	32	1.32
P-73 X	28 Sep					100	0
P-74	25 Sep					100	0
P-75	26 Sep		4		16	80	0.36
P-76 X	6 Jun					100	0
P-76	25 Sep				4	96	0.04
P-77 X	25 Sep					100	0
P-78	25 Sep					100	0
P-79	25 Sep				20	80	0.20
P-85	25 Sep					100	0
P-86	25 Sep					100	0
P-87	2 Oct					100	0
P-88 A	3 Oct					100	0
P-95 A	10 Oct					100	0
P-97 A	10 Oct					100	0

Occurrence of Dermocystidium marinum in Live Oysters
of the Chesapeake Bay Area, 1973, 1974, 1975 & 1976
(25 oysters per sample except as specified)

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensitites				Weighted Incidence
			H	M	L	N	
		1973					
P-82 C	8 Nov 73	5		40	60		5.00
P-84 A	8 Nov	7				100	0
P-86 C	5 Oct					100	0
P-87 A	4 Oct					100	0
P-88 A	11 Oct					100	0
P-95 C	8 Oct					100	0
P-100	2 Nov					100	0
P-101 A	2 Nov					100	0
P-103	4 Oct					100	0
Y-74	2 Nov				14	86	0.14
1971 Piankatank River Set in York River	4 Oct		12	4	68	16	1.40
		1974					
used gapers from trays for base of Dermo Inf. - no live samples taken							
		1975					
used gapers from trays for base of Dermo Inf. - no live samples taken							
		1976					
R-34	28 Oct		4	4	28	64	0.60
R-35	28 Oct				8	92	0.08
Balls Pt.	28 Oct			8	24	68	0.48
P-85	14 Sep		16	12	44	28	1.60
P-90	14 Sep		24	12	60	4	2.16
P-141	4 Nov				4	96	0.16
P-147 X	15 Oct		4	16	32	48	1.00
P-152	15 Oct		8	8	36	48	1.00
P-159	14 Oct			4	8	88	0.20

P-160	14 Oct			12	8	80	0.44
J-40	25 Oct				24	76	0.24
J-41	25 Oct			4	20	72	0.32
Brown Shoals	19 Oct		8	4	16	72	0.68
Nansemond Ridge	19 Oct				4	96	0.04
Thomas Rock	19 Oct			4	24	72	0.36
Wreck Shoals	19 Oct					100	0
White Shoals	19 Oct		4		4	92	0.24
High Shoals	19 Oct		4		4	92	0.24
Tow Stake Bar	30 Sep		4	4	8	84	0.40
Pultz Bar	30 Sep		12	4	44	40	1.16
# oysters (6 Mar 76)	22 Sep	7					1.85
# oysters (15 Jul 76)	22 Sep	8					2.50
# oysters (6 Mar 76)	15 Sep	2					4.00
# oysters (15 Jul 76)	15 Sep	11					3.27
Between High Shoals & Nansemond Ridge	29 Nov				4	96	0.04

Occurrence of *Dermocystidium marinum* in
Live Oysters of the Chesapeake Bay Area, 1977

Location of Oysters	Date Sampled	No. Tested	Percentage Infected by Intensities H	M	L	N	Weighted Incidence
York River							
P-147X	5 May	25				100	0
P-153	10 Oct	25				100	0
P-160	7 Oct	25	12	8	48	32	1.32
P-170	5 Oct	25				100	0
Y-93	4 Nov	25				100	0
Y-95	6 Oct	24				100	0
Tillage natives	27 Sep	25				100	0
Tillage natives	26 Oct	25				100	0
Pages Rock	28 Sep	25	4	4	12	80	0.44
Dermo Inf. Expt. Lot 2	2 Nov	25			8	92	0.08
No. Oysters at VIMS (killed)	May-Nov	88				100	0
Nancy W. oysters	May-Nov	41				100	0
James River							
Brown Shoals	11 Oct	25	4	8	16	72	0.60
Wreck Shoals	4 May	25				100	0
Wreck Shoals	11 Oct	25	4			96	0.20
Rainbow Rock	11 Oct	25				100	0
Wreck Shoals at VIMS (in heated aquarium since 4 May)	27 May	25				100	0
Mobjack Bay							
Mobjack Bay offshore Brown's Bay	18 Oct	25				100	0
Rappahannock River							
Three Branches-Piank.	10 Nov	25			36	64	0.36
Broad Creek	10 Nov	25	4			96	0.20
Parrotts Rock	22 Sep	25	8	8	16	68	0.80
Balls Pt.	22 Sep	25			4	96	0.04
Smokey Point	24 Oct	25				100	0
Smokey Point	10 Nov	25			16	84	0.16
Potomac River							
Joneses Pt.	31 Aug	25	4		24	72	0.44

Location of Oysters	Date Sampled	No. Tested	Percentage Infected by Intensities H	M	L	N	Weighted Incidence
		Pocmoke Sound					
V Drewer 1973 Shellplant	13 Jul	25				100	0
V Drewer 1974 Shellplant	13 Jul	25				100	0
V. Drewer 1975 Shellplant (off Saxis below North End Point)	13 Jul	25				100	0

Occurrence of *Dermocystidium marinum* in Live Oysters
of the Chesapeake Bay Area, 1978 & 1979
(25 oysters per sample except as specified)

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensitites H	M	L	N	Weighted Incidence
		1978					
North Carolina Cedar Is. Bay (brought in by D. Haven)	7 Dec				8	92	0.08
York River Severn River, NW Branch Jun 75-shellstrike	11 Sep			8	24	68	0.48
York River Sarahs Creek Offshore Shellplants-74 reef shells (Y102)	14 Sep					100	0
# Oysters Killed (13 Mar 78 group)	24 Aug	9				100	0
# Oysters Killed (21 Jul 78 group)	29 Aug	4				100	0
# Oysters Killed (13 Mar 78 group)	31 Aug	10				100	0
		1979					
Balls Pt. Natives	23 Oct					100	0
J-49 H.B. Tray	22 Oct					100	0
MJ-30 Mobjack Bay	17 Oct					100	0
Y-102	11 Oct			4	24	72	0.32
Pages Rock Natives	4 Nov		4		8	88	0.28

York River Offshore Sarahs Cr. (MSX-resistant oysters) Native!	19 Sep		8	4	28	60	0.80
# Oysters Killed (20 Mar 79 group)	1 Aug	1				100	0
	26 Sep	2				100	0
	11 Oct	1				100	0
	31 Oct	1				100	0
# Oysters Killed (16 Jul 79 group)	26 Sep	2				100	0
	11 Oct	2				100	0
	31 Oct	2				100	0
	14 Nov	1				100	0
# Oysters Killed (26 Sep 79 group)	16 Nov	3				100	0

= numbered oysters weighed weekly

Occurrence of Perkinsus marinus ("Dermo") in
Live Oysters from the Chesapeake Bay Area, 1980

Location of Oysters	Date Sampled	No. Tested	Percentages Infected by Intensities				Weighted Incidence
			H	M	L	N	
	James River						
Brown Shoal Natives	2 Oct 80	25	4	8	20	68	0.64
Brown Shoal Natives	3 Nov	20	15	5	5	75	0.95
Wreck Shoal Natives	2 Oct	25				100	0
	York River						
York River Natives	10 Oct	25		8	16	76	0.40
	Rappahannock River						
Burton's Pt. Native	6 Nov	25		8	52	40	0.76
Parrotts Rock Natives	8 Oct	25		4	12	84	0.24
Lower Temple Bay	6 Nov	25			4	96	0.04
Ball's Pt. Natives	8 Oct	25			4	96	0.04
Smokey Pt. Natives	5 Nov	25				100	0
	Great Wicomico River						
Fleeton Pt.	1 Dec	25			32	68	0.32
Tray No	York River Tray Station - Tillages						
P-68	30 Jun	25			4	96	0.04
P-73	30 Jun	11			55	45	0.55
P-150	30 Jun	23	8	8	24	54	1.00
P-165	6 Aug	25			8	92	0.08
P-193	9 Dec	25			4	96	0.04
Y-102	18 Aug	25			8	92	0.08
Y-102	9 Oct	25	8	4	10	78	0.72